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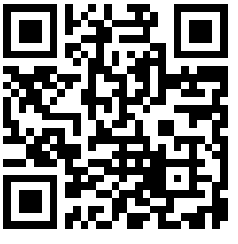

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# Wireless Experiments on an Aeroplane

THE applications of wireless telegraphy are now so widespread that much progress has been made in directions which in the ordinary way receive but little recognition. One of these applications is in telegraphing from aeroplanes, airships, and balloons. The advantage of being able to communicate with land or other stations whilst in the air has been well exemplified in the case of the Wellman flight, as well as on other occasions, and although little has been published on this important subject, it is not to be supposed that things have been allowed to remain in a quiescent state ; on the contrary, some important experiments are now being conducted by Marconi's Wireless Telegraph Company, although it is not yet possible to publish the results of these experiments. On March 16th, when some wireless experiments were being carried out on Mr. Howard Flanders' monoplane at Brooklands Aviation Grounds, near Weybridge, a curious accident accurred. On the previous evening a trial flight was made after the wireless apparatus had been fitted to the machine, and everything seemed in perfect working order. On the Saturday morning, as the weather was exceedingly favourable for flying, the machine was taken out again, but it was then that the mishap occurred. The aviator was flying very low at the time, and on landing his first skid apparently stuck in the ground owing to a too sudden descent and to the speed at which the aeroplane was moving at the time—approximately 60 miles per hour—the machine turning completely over. The aviator was thrown out of his seat, and when picked up was unconscious. The fusilage of the machine was smashed in two places, and the propeller was also damaged. The wings had apparently escaped unhurt, but had to be stripped of their fabric and thoroughly overhauled. The exhaust pipes, radiators, and lubricating pipes on the engine were also damaged, and the front skid of the aeroplane was smashed in half. Amidst the débris of damaged parts it would not have been surprising had the wireless apparatus been smashed, especially as the oil tank beside which the wireless apparatus was fitted had been severely battered in, and was leaking badly. After removing the sand and dirt with which everything was covered, it was found, however, that the wireless apparatus had escaped quite undamaged, and was in working order ; even the aerial wire, which was attached to the broken fusilage, remained intact.

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THE RIGHT HON.
HERBERT L. SAMUEL, M.P.

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# The Right Hon. Herbert Louis Samuel, M.P.

## H.M. Postmaster-General

MR. HERBERT SAMUEL, who has successfully carried out the negotiations on behalf of the Government with Marconi's Wireless Telegraph Company of the scheme for the establishment of a chain of wireless telegraph stations throughout the Empire, was born in Liverpool on November 6th, 1870. He was educated at University College School and Balliol College, Oxford, where he won first-class honours. At the General Elections of 1895 and 1900 he contested South Oxfordshire, and on each occasion was defeated by a narrow majority. At a by-election in 1902 he was elected for the Cleveland Division of Yorkshire, which he still represents. On the formation of the Liberal Administration in 1906 he became Under-Secretary for the Home Department. In 1909 he was appointed Chancellor of the Duchy of Lancaster with a seat in the Cabinet, and a year later he was appointed to the arduous post of Postmaster-General, a position which he still retains and covers with great distinction.

When at the Home Office Mr. Samuel's faculty for mastering detail was revealed in the Children's Bill, which the Home Secretary of that day surrendered entirely to his hands. No more humane measure has ever been before Parliament, and certainly Parliament never saw a measure more ably handled, both in the House of Commons and in Committee. It was impossible to find a flaw in the workmanship, and Mr. Samuel's skill in Committee won the rare distinction of a dinner in honour of his success. It was the success of one who has in remarkable combination the *suaviter in modo* and the *forfiter in re*. He is thrice armed, for he adds to knowledge rare astuteness and blameless temper. It is impossible to trip him up, either in fact or in feeling. He has the enormous advantage of always knowing more about his subject than his opponent, and that is a great aid to cheerfulness of temper. "There are two ways of governing men," said Disraeli in one of his novels. "Either you must be superior to them, or despise them." Mr. Samuel has adopted the better way.

In a brilliant impressionist sketch of Mr. Samuel, written by Mr. A. G. Gardiner some years ago, his character is succinctly summarised in the following notable passage :

"He is the type of efficiency. There is no more industrious man in the Ministry, none whom you find more completely equipped in knowledge, or in clear-cut decisive opinion. No matter what subject you raise bearing on his department, you find that this undemonstrative, wise young man is prepared to crush you with blue books you have never heard of, and experiences of places where you have never been. When I met him at the Sweated Industries Exhibition, the impression left was that of a man who had nothing to learn on the subject. He had studied it in the East End ; he had studied it on the Continent years before ; he could tell you more than you could ever hope to know. You felt humble and cheap."

It has been said by one who was a comrade of Mr. Samuel's in his childhood that his favourite amusement was politics, and that when other boys were reading Ballantyne he was reading blue books. One can imagine him as a boy at University College School planning out his future with the quiet certitude of a mathematical mind engaged on an easily negotiable proposition, and, having planned it, working silently and unceasingly for its accomplishment. It is characteristic of his assured restraint that he has never sought to force the pace of his progress. No extravagance of speech or action is ever associated with his carefully considered career. He does not thrust himself into the limelight. He is content to be forgotten. He knows the power of discreet silence as the man of taste knows the value of the blank space on the wall.

Little wonder, therefore, that, to a man of his calibre, so great a subject as wireless telegraphy should become an inspiration, and that his enormous capacity for mastering details of a subject should enable him to appreciate the immense value of an Imperial scheme such as has been decided upon. Mr. Samuel conducts the great department of which he is the chief in a manner alike creditable to himself and to the nation which has entrusted the task to him.

In Mr. Samuel's precise and profusely pigeon-holed mind there is no room for hesitation about conclusions, because there is no room for doubt about facts. Mr. Samuel is the author of a striking book, "Liberalism : Its Principles and Proposals," published ten years ago, and numerous political pamphlets and articles.

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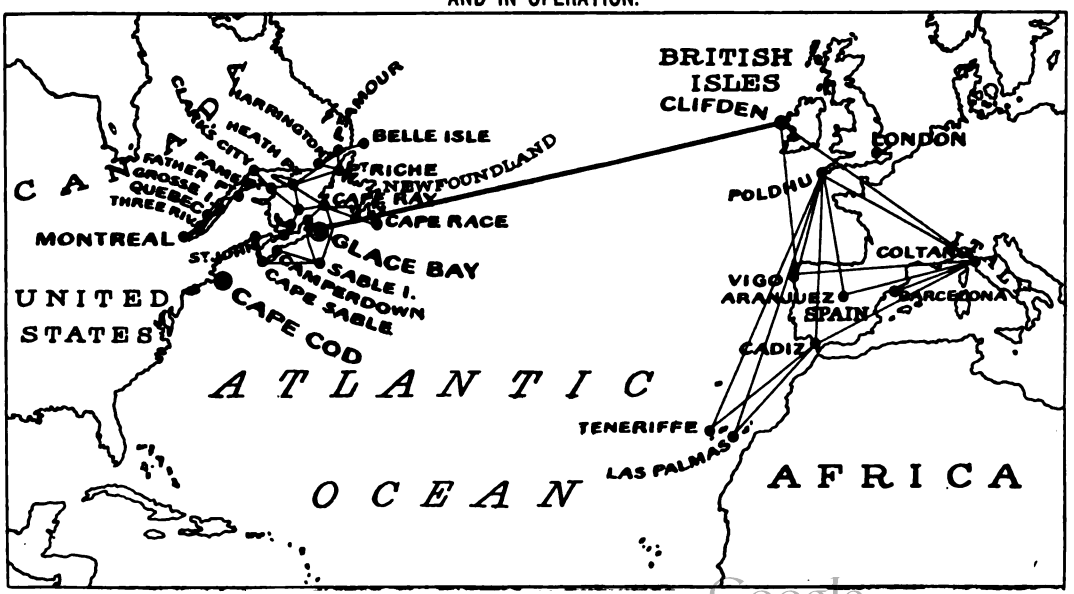
# The Dawn of a New Era

## Empire Scheme to be Commenced—The Details Considered

IN 1895 a young man living at Bologna, and who was barely 21 years of age, was immersed deeply in some abstruse experiments. He had been studying electricity under Professor Righi at the University of Bologna, and in the course of his studies had been fascinated with certain phenomena. He began to theorise, and in a short while endeavoured to apply what he had conceived to practice. He then commenced experimenting, and at once recognised that Hertzian waves could be used for telegraphing without wires. The man was Guglielmo Marconi. His first efforts were made at his father's villa in Pontecchio, near Bologna, across distances of only a few yards. The next step was to try longer distances in the garden, and after numerous experiments the inventor was able to receive signals the length of the garden. In 1896 Mr. Marconi came to England, took out his first patent for wireless telegraphy, and conducted several demonstrations under the supervision of the Post Office, War Office, and the Admiralty. Tests were first made successfully between St. Martins-le-Grand and the Thames Embankment, but the demonstrations which first roused the authorities and the public to the importance of the invention were those carried out on Salisbury Plain, when Mr. Marconi covered a distance of four miles. In May, 1897, a series of demonstrations were made across the Bristol Channel, communication being established between Penarth and Bream Down, a distance of nearly nine miles. Continuing, in July, 1897, Mr. Marconi, under the auspices of the Italian Government,

COMMERCIAL TELEGRAPH STATIONS CONSTRUCTED BY MARCONI'S WIRELESS TELEGRAPH CO. LTD., AND IN OPERATION.

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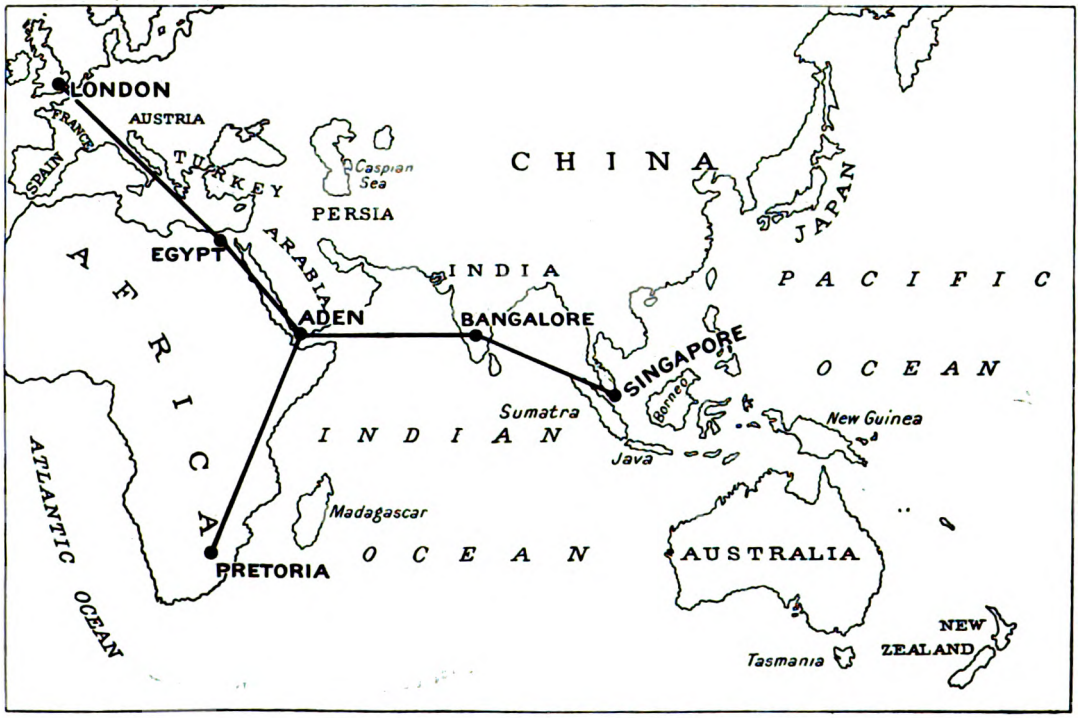
transmitted messages between warships at Spezia, four miles apart. Shortly afterwards he erected stations at Alum Bay in the Isle of Wight and at Bournemouth (subsequently removed to Poole), fourteen miles distant from Alum Bay, over sea. By this time the system had reached the stage at which another link in the chain of development was required, and a company was formed to realise the commercial benefits of wireless telegraphy on a large scale—to manufacture the instruments and develop the business generally. In July, 1897, the Wireless Telegraph and Signal Co., Ltd., was

years after he had made the first experiments in the garden at Pontecchio, Mr. Marconi had raised the range of transmission by wireless telegraphy to over two hundred miles. It was inevitable, therefore, that he should expect to increase the range still further, and to bridge the Atlantic as he had bridged the Channel. Pessimistic prophets were not slow to declare such an event to be impossible, but towards the end of 1901 Mr. Marconi had made arrangements for experiments in Transatlantic transmission. A temporary installation was used in Newfoundland for the purpose of testing how

STATIONS TO BE IMMEDIATELY CONSTRUCTED BY MARCONI'S WIRELESS TELEGRAPH CO LTD., FOR THE IMPERIAL TELEGRAPH SERVICE




registered, the name of the company being subsequently altered to Marconi's Wireless Telegraph Co., Ltd. For some time, of course, the company had to continue the laborious pioneering work undertaken by Mr. Marconi, and under their ægis a remarkable advance was made by Mr. Marconi. It would be impossible in our limited space to convey any adequate impression of the great achievements which have been made up to this date, and in the course of which the English Channel was bridged, naval and marine demonstrations successfully carried out, leading up eventually to the crossing of the Atlantic. About five

far arrangements in Cornwall had been conducted on the right lines. Mr. Marconi left for Newfoundland on November 27th, 1901, with two assistants, where Mr. Marconi carried out his experiments by means of receivers fixed to elevated wires supported by balloons or kites. His assistants at Poldhu had received instructions to send on and after December 11th, during certain hours every day, a series of "S's" followed by a short message. On December 12th the signals transmitted from Cornwall were clearly received at the prearranged times. The result obtained was sufficient to convince Mr. Marconi that by means

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of permanent stations and the employment of more power in the transmitters it would be possible to send messages across the Atlantic Ocean with the same facility with which they were being sent over shorter distances. The Canadian Government granted a subsidy of $80,000 towards the equipment of a Trans-atlantic station at Glace Bay, and during the time that constructional work was in progress tests from the corresponding station at Poldhu, in Cornwall, were carried out over considerable distances, the Italian Government kindly placing the cruiser "Carlo Alberto" at Mr. Marconi's disposal for this purpose. In December, 1902, messages were for the first time exchanged at night between the stations at Poldhu and Glace Bay. In 1905 preparations were made for the construction of a Trans-atlantic station near Clifden, in Galway, and a limited public service was then opened, to be extended three years later to a general public service. This service, as the world now knows, is now employed to its fullest capacity.

**Bridging the Atlantic**

It is doubtful whether that ambiguous personality "the man in the street" realises the tremendous grip which Mr. Marconi's invention has effected upon the world at large. His instruments which flash messages through space are to be found within the Arctic Circle, while the great centres of civilisation can maintain communication with the frontiers of the Antarctic Circle as easily as they can converse with their suburbs barely five miles distant. Canada and the United States are linked as firmly with Europe by an invisible influence as if they were connected by dry land instead of a vast expanse of water. The general conception prevails that wireless telegraphy is confined to ocean liners, the opposite shores of vast expanses of water, such as the Atlantic and the Pacific, and warships. This is a great fallacy. As a matter of fact, wireless stations are dotted about in all parts of the world between the two Poles, and to-day one cannot circumvent the globe without being in touch with one or more of those outposts standing sentinel over some rocky sea-girt shore. The splendid isolation of the vessel in mid-ocean is a thing of the past; a passenger no longer can cut himself off from the turmoil of commerce by an ocean voyage.

To gain an estimate of the great importance which wireless telegraphy has now attained for social, commercial, and defensive purposes, it is necessary to appreciate the early experimental difficulties which Mr. Marconi has had to overcome. With a genius for enterprise and an attachment that was almost Hellenic in its ardour, those who have been associated with Mr. Marconi in the commercial development of his great work have raised wireless telegraphy to a unique position among the great enterprises, not merely of England, but of the world. They have demonstrated its great commercial importance in providing cheap and rapid communication over very long distances in a manner that was at one time undreamt of. Commencing with ship to shore communication, it was a short step to shore to shore communication; and then over long expanses of land; knitting together scattered countries into one continuous chain of communication in which messages can be ticked out at the rate of fifty words a minute almost simultaneously in cities as far apart as London and Aden or Singapore.

**The Empire Scheme**

The culminating point has now been reached in the decision of the British Government to proceed immediately with the establishment of a chain of wireless stations round the Empire. This is an event which is of supreme importance and which even in these stirring times has attracted world-wide attention. The Agreement giving effect to this decision was signed in London on March 7th, the contracting parties being the Imperial Government and Marconi's Wireless Telegraph Co., Ltd. It is unnecessary to be endowed with any abnormal degree of imaginative power to perceive the potentialities of this scheme. The imperial and strategic aspects have been lucidly presented by Sir John Barren, the Parliamentary Secretary to the Postmaster-General, in a speech before the Association of Chambers of Commerce in London. This speech showed a profound knowledge of the subject, coupled with a rare insight into the future prospects of the scheme as the extract given below will show. The Association deplored the absence of suitable cable communication throughout the Empire, and a resolution was proposed asking the Government to embark upon a scheme of State-owned cables.

**Sir John Barren's View of Wireless**

In asking the members not to commit the Government to the heavy expense involved in the laying of cables, Sir John made the following observations:

> "Wireless telegraphy . . . has got to this point, that it was decided at the Imperial Conference that a system should forthwith be embarked upon for connecting up this country with the other side of the world. The arrangements are already in progress; the contract is let for that system, and in due course a system will be started running from this country to Cyprus, from Cyprus to Aden, from Aden to Ceylon, from Ceylon to the Straits Settlements, from the Straits Settlements to Western Australia, and from Western Australia crossing Australia to New

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Zealand, linking ourselves up in a series of six stations with the dominions on the other side of the world. (Cheers.) Now that system will be worked by an automatic process which will tick out fifty words a minute, and while those words are being ticked out in Great Britain they are simultaneously being ticked out in Cyprus, Aden and the other stations. So by this process—which, I suppose, to our remote ancestors would have seemed nothing but wizardry, and to our grandfathers too wonderful to contemplate—we are within a short distance of having a regular and permanent automatic flow of words entirely on British territory—entirely controlled by the self-governing Colonies concerned, and supported both between ourselves and the Pacific.

**Scope of Extension**

"It would be rash for me to say how far we may hope that such a system can be extended—what branches can be taken from it, how far it can be linked up in other parts of the world. The point I want to make is this, that your resolution here is concerned with the linking up of the Antipodes with ourselves by means of a Pacific cable with a land line in Canada and a Government Atlantic cable. We are within a very short distance of getting to the Antipodes as effectively by another route. How cheap that route may be, and how far wireless telegraphy may altogether drive out cable, is a matter which is so obscure that I would ask you to agree with certain of the Colonial Premiers who, after hearing all these matters at the Imperial Conference, took the view that this is not the moment at which we should commit ourselves absolutely to a cable on the old system. Sir Wilfred Laurier said that in view of the facts brought out, and speaking for Canada, he wished to reserve judgment on the necessity and final expediency of a State Atlantic cable and line across Canada. Sir David Graaff said it was impossible to say how far wireless telegraphy might develop in the future, and that he did not feel that, under all the circumstances of the moment, this was the best opportunity for involving ourselves in the spending of very big sums, possibly even millions if it came to a question of buying up the cables, in order to start a system of transmission which might conceivably be largely 'knocked out' within the next few years.

"I would venture to suggest that under all the circumstances, the facts being what they are, and the future promising what it does, it would certainly not be expedient for the British Post Office, and it might not be expedient even for a business body such as you, to commit yourselves formally and definitely to a heavy expenditure involving an almost certain annual loss in view of the present degree of security which we possess, of the increasing conveniences which we are enjoying, and possible developments of this alternative system in future years." (Loud cheers.)

After this pronouncement it remains but to give a bare outline of the scheme. It will be noticed from the map on page 5 that six stations are now about to be erected as follows: London, Egypt, Aden, Bangalore (India), Pretoria (South Africa), and Singapore.

**Details of the Contract**

The Marconi Company will receive a payment of £60,000 for each station, exclusive of site, foundations for machinery, and buildings, and the buildings themselves, while the terms further provide that the company shall receive 10 per cent. of the gross receipts of all the long-distance stations erected for the term of the Agreement, which is for twenty-eight years from the date of the completion of the first six stations. The stations will be worked during those six months by the company, and thereafter by the Government. The effect of the arrangement is to place the company in the position of a partner with the Government in the development of a world-wide service of wireless telegraphy, from which the company will draw a revenue which must inevitably reach a large sum, while the directors will be relieved of all responsibility in regard to the working of the system. Meanwhile, the existing business of the company will continue to be conducted as at present. A clause has been inserted in the Agreement enabling the authorities, if they so desire, to cancel the Agreement at the end of the first eighteen years, but in such an event they would cease to have the right of use of any of the company's patented processes or machinery.

**Independence of Cables**

The chain of stations at present decided upon represents only the beginning of a scheme which will be still further extended in the near future throughout the Empire, so as to enable the Empire to be, to a great extent, independent of submarine cables. The terminals will have a capacity of between 100 and 200 words per minute. The scale of charges will, of course, be fixed by the Government as the predominant partner in the working of the system, and it is anticipated that long-distance telegraphy will very soon be much cheaper than has ever been the case before. The indications are all in favour of a revolution

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in the cost of communicating by wireless telegraphy between the five continents.

The Agreement now concluded with the British Government will be followed hereafter by others of a similar nature with other countries. The importance of the Imperial wireless scheme for public, commercial and strategic purposes will be appreciated by a glance at the maps on pages 4 and 5, one of which shows the position of the projected stations and the other the existing long-distance Marconi stations. There can be no doubt that stations will be established in the neighbouring countries to the Colonies for communication with them, in which case the Colonies will be in a position of being able to communicate cheaply and directly with any country they are doing business with within a range of two or three thousand miles. The erection of such stations should within a short time enormously reduce the rate charged to many of the colonies for telegraphic communication with other colonies and the home country.

**Effect upon Telegraph Rates**

As an instance of telegraph rates likely to be affected by the Imperial wireless scheme the following may be cited: The cable rate to British Guiana is at present 7s. per word; a wireless station erected in that colony would enable the inhabitants there to communicate directly with similar stations erected in Central America, Brazil, and the United States, also with other stations placed in the British Indies, and, through the stations in Spain, with the United Kingdom, at a rate probably not exceeding 1s. per word, and in every case with the greatest ease. This is a typical instance of the extreme flexibility of wireless communication, and illustrates some of the far-reaching advantages of the Imperial scheme. Under present conditions messages must be sent to some of those countries by very devious routes and at very high rates.

But there is another aspect of the question which must not be lost sight of, and that is the value to the Empire of a wireless chain. By this means the Home Government will not only secure cheaper and easier communication with the colonies, but much quicker communication with its fleet, and it will shortly be possible for the fleet travelling towards the east to be in regular communication with the Admiralty at any point on this side of Hong-Kong.

There is no need to enlarge on the possibilities thus opened out for naval and military purposes. The importance of this practical solution of the problem of independent electric wave telegraphy in which each wireless circuit is as private as one with a wire is obvious without comment. Wireless telegraphy is only in comparative infancy with a vast field to conquer. The constituents in the form of unconnected routes are there; the means for effecting this communication exist. In the plenitude of their power the Marconi Company are in possession not merely of the key to greatness, but of a means of powerful service to mankind and to the Empire.

## Communication with the West Indies

IN the course of a despatch to the Acting Governor of British Guiana, the Secretary of State for the Colonies (Mr. L. Harcourt) states that he has had under consideration the proposals contained in the report of the Royal Commission on Trade Relations between Canada and the West Indies with regard to the improvement of the telegraph system with the West Indian Colonies and Bermuda. These proposals contemplated the acquisition by the State of the several cables owned by the cable companies working in the West Indies, the duplication of certain cables, and the provision of wireless stations to supplement the cable system in certain cases.

In face of the adverse report of his expert advisers Mr. Harcourt could not avoid the conclusion that the circumstances generally did not warrant the expenditure of the very considerable sums which would be involved in carrying out the suggestions of the Royal Commission. There was no ground for hoping that His Majesty's Government would consider themselves justified in asking Parliament to provide the necessary funds, and he was satisfied that the proposed expenditure would be beyond the resources of the Colonial Governments concerned and out of all proportion to the benefits which they might expect to derive from the scheme.

With regard to alternative measures, Mr. Harcourt states that he believes the gradual extension of communication by wireless telegraphy between adjacent colonies offers the best prospects for obtaining in the near future a cheaper service with the resources at the command of the Governments concerned.

Mr. Harcourt explains that the delay in dealing with the recommendations of the Royal Commission has been due to the necessity of considering the bearing on them of various proposals of wider application, including the scheme for connecting different parts of the Empire by wireless telegraphy. The decision to proceed with this scheme in a modified form will not affect the erection of wireless stations in the West Indies.

Mr. J. B. Mowat, from the Southern Wireless Telegraph Company (Royal Engineers), has been gazetted Second Lieutenant. Lieut. John W. Danielsen, Southern Airline Telegraph Company, has been promoted to the rank of Captain. Mr. Gerald Patrick W. Martin has been gazetted Second Lieutenant.

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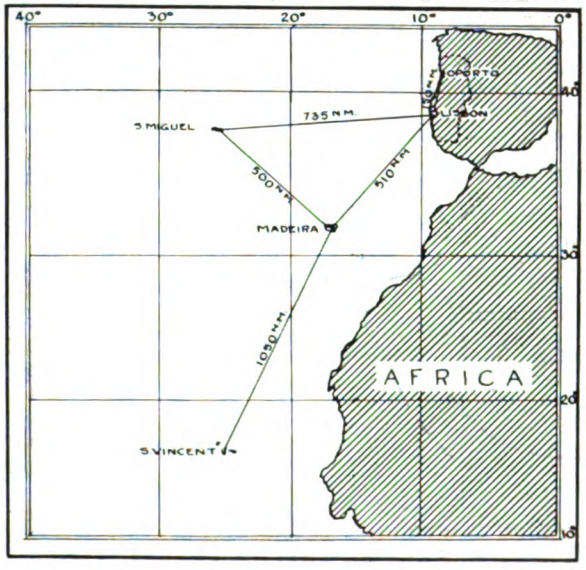
# Wireless Telegraphy in Portugal

PORTUGAL is now to rank with other nations of the world enjoying the benefits of a wireless telegraph system. A provisional contract has just been entered into between the Government of the Republic and Marconi's Wireless Telegraph Co., Ltd., for the erection and installation of five radiotelegraph stations. One of these stations will be in the Azores Archipelago, which lies at an average distance of a thousand miles due west of the Portuguese coast, a third of the way across the Atlantic towards America. The beautiful island of Madeira, which lies to the south-west of the mainland, will be brought into radiotelegraphic communication. Much farther away, within the tropics, and also in the Atlantic Ocean, is the Cape Verde Archipelago, on one of whose small islands the Government have decided to erect a station also. Lisbon will become possessed of a station, and so will Oporto. Under the impetus given by Great Britain and other great nations, the Portuguese have awakened to the need for utilising the means of long-distance radiotelegraphic communication which has been made possible by the Marconi Company, and which must ultimately be of inestimable value to them.




*Proposed Stations for the Portuguese Government.*

The stations at Madeira, and St. Vincent, in the Cape Verde Archipelago, will each be equipped with 100-h.p. wireless plant of standard design, and will have a range by day of 2,500 kilometres. St. Vincent is described as being more English than Portuguese. Ships bound for South America frequently call there, and the new wireless station will make the island more familiar among travellers than was possible with the cable station.

The station at Lisbon and the other on the Azores will each be equipped with 40-h.p. plant, and will have a range by day of 1,600 kilometres. The Azores islands are famous for their oranges. Strategically, of course, they occupy an important position in regard to any naval war in the Atlantic. The station at Oporto will be a short distance one; it will be equipped with 12-h.p. standard wireless plant, and will have a range of 500 kilometres. The stations will be able to communicate with other coast stations and with ships. The construction of the buildings, as well as the foundations for the reception of the engines and masts, will be in charge of the Government, but the Marconi Company will supply all the plans of the buildings and of the respective foundations.

The Portuguese stations will complete the network in the South Atlantic for wireless communication between Europe and the West Coast of Africa. Their commercial and strategical importance, therefore, cannot be gainsaid.

### Military Telegraphy.

In another part of this issue we give a brief account of some trials with portable wireless field station sets carried out in Belgium. The utility of these sets for military purposes has been demonstrated in many countries—notably Spain, Siam, Roumania, and Turkey, the demonstrations in the latter country having been carried out in May, 1911. The Belgian trials evinced a great deal of interest, and were successful in spite of the unfavourable climatic conditions under which they were carried out.

# Mechanical Analogies Applied to Wireless Telegraphy*

By Captain H. Riall Sankey, R.E. (retired), M.I.M.E.

THE broad principle on which wireless telegraphy acts is to produce, at the sending station, ether vibrations known as electro-magnetic waves, which are transmitted in all directions in a space of about 40 miles thick above the earth's surface, and to have at the receiving station an apparatus capable of detecting these waves. Electro-magnetic waves are not transmitted through an electric conductor, but they are transmitted in a dielectric. The earth itself is a conductor, and so is the attenuated air above the 40-mile limit, but between the two the pressure of the air is sufficient to make it a dielectric, and it is in this space, therefore, that the electro-magnetic waves are propagated. The existence of these electro-magnetic waves was proved

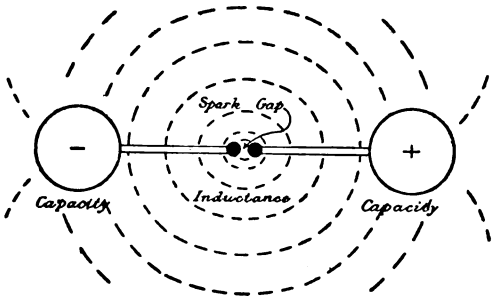



Fig. 1.

mathematically and the laws they obey were determined by Clerk Maxwell in 1864, but it was only in 1888 that Hertz exhibited them in a physical manner, and they are therefore also known as Hertzian waves. The apparatus used for this purpose is known as a Hertz oscillator, and it consists essentially of a "capacity," an "inductance," and a "spark-gap," as indicated diagrammatically in Fig. 1. The two circles represent the capacity or electric condenser, and when electrically charged, one with a positive charge and the other with a negative charge, lines of electric stress are produced in the surrounding medium or dielectric, as indicated by the dotted lines. The conductors from the plates to the spark-balls constitute the inductance. The means of charging is not shown, but if it is such that the charge can be increased, the electric stress will also increase and become greater and greater until its

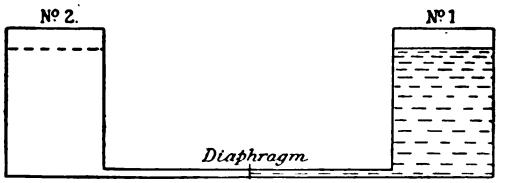



Fig. 2.

intensity between the spark-balls is more than the dielectric (air) can sustain; then a spark will pass, and the condenser will be discharged through the inductance and the spark-gap. The effect of the spark is to make the air in the gap conducting for the time being, and if the relative values of the capacity and inductance are suitable, it can be shown that the discharge will be of an oscillatory character—that is to say, electricity will surge backwards and forwards from one plate to the other. To form a mental picture of the action the following mechanical analogy will be helpful.

In Fig. 2 are shown two glass vessels connected by a pipe in which is placed a diaphragm. The right-hand vessel (No. 1) can be gradually filled with water, because the diaphragm prevents the water finding its way into the left-hand vessel (No. 2). The pressure on the diaphragm will therefore increase until it is no longer able to bear the pressure, when it will burst, and the water in vessel No. 1 will rush through the pipe into vessel No. 2. In so doing the water will acquire velocity and kinetic energy will be produced. As the water rises in vessel No. 2 the velocity will be annulled and the kinetic energy will be reconverted into energy of head in vessel No. 2. If it is supposed that there is no friction, the level of the water in vessel No. 2 will finally reach the same height at which it stood in vessel No. 1 just before the diaphragm burst. The water now

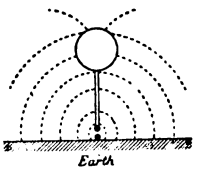



Fig. 3.

* Abstract of a lecture delivered before the Graduates f the Institution of Mechanical Engineers.

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will flow back into vessel No. 1 and reach its original level, and obviously these oscillations of the water from one vessel to the other will be maintained continuously. It will be seen

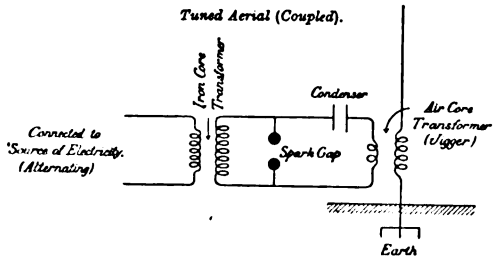


*Fig. 4.*

that the two vessels represent the capacity that the inertia of the water in the pipe represents the inductance, and the diaphragm the spark-gap. Actually, of course, there is friction in the pipe, so that the water will not rise to the same level in vessel No. 2 as it stood in No. 1; in other words, the amplitude of the oscillations will be gradually diminished, or, as it is otherwise expressed, they will be damped oscillations, and in time the water will settle down to equal levels in both vessels.

If it is supposed that the vessels, instead of being of glass, are made of india-rubber, then the vessels will expand each time they are filled, and they will contract each time they are emptied. A pulsating motion will be thus produced, causing pressure waves in the air, which will travel in all directions with the velocity of sound. The energy expended in thus producing air-waves will be radiated, and the damping of the amplitude of the water-level oscillations will thereby be increased, so that the water will come to rest more quickly than it did with the glass vessels.

If one of the plates in the Hertzian oscillator is increased in size, and the conductor from it to the spark-ball is correspondingly reduced in length, no alteration will take place in the lines of electric stress starting from the other plate. In fact, the lower plate may be practically infinite in size, or, in other words, may

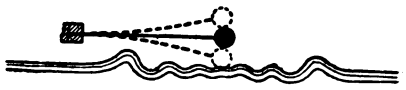

*Fig. 5.*

become the earth. This is the modification of the Hertz oscillator conceived by Marconi, and was the initial invention of wireless telegraphy.

It is not necessary to have a plate on the top of the conductor, because the capacity can be obtained by means of a sufficient length of plain wire, which is technically known as the aerial.

It is, of course, necessary to provide means for charging the oscillating circuit or aerial as might be required to produce the telegraphic signs—namely, the dot and dash of the Morse alphabet, for example—by connecting the spark-gap of the aerial circuit to the secondary of an induction coil, whose function was to recharge the aerial after each discharge and oscillation.

A plain aerial such as above described radiates energy rapidly—that is to say, it is a good radiator. The consequence is that after each discharge there are only three or four rapidly damped oscillations, whereas a much greater number is necessary for long-distance work. Moreover, if the voltage of the charge is too great, the air breaks down at the top end of the aerial by what is known as a brush discharge, and thus a limit is fixed to the energy which can be imparted to the short train of electro-magnetic waves. The practical result was that the maximum range obtainable was about 70 miles.

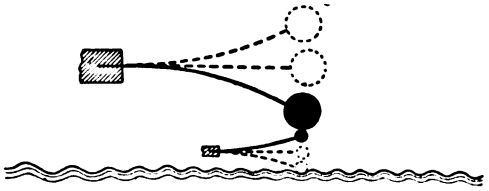

*Fig. 6.*

What is wanted for practical wireless telegraphy is some means of impressing a large amount of energy on the aerial without requiring too great a voltage, and at the same time producing a long series, or train of waves, with very little damping. To obtain this effect Marconi made his next important invention, which is shown diagrammatically in Fig. 4, and is the subject-matter of the celebrated 7777 Patent. The improvement described in this patent is the foundation of all the practical wireless telegraphy of to-day, and it immediately increased the range (over water) from 70 miles to 250 miles, and has enabled the commercial working at a range of 2,400 miles (Clifden, Galway, to Glace Bay, Nova Scotia) to be successfully carried out. In the immediate future much longer ranges will be possible, and already Marconi has received messages at Buenos Aires from Clifden and from Glace Bay at a range of over 6,000 miles. A mechanical analogy will explain the above in a simple manner.

If a weight is dropped into still water concentric wavelets will be formed. If the weight is too large or the height from which it is dropped is too great, not only will waves be

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formed, but there will be splashing, and this splashing corresponds to the brush discharge already referred to. If the weight be fixed to a horizontal spring, as shown in Fig. 5, and a force is momentarily applied to the weight, it will oscillate in a well-known manner. It will hit the water, and each time it does so will produce waves in the manner already pointed out, and if the energy is too great there will be splashing as well as waves. A smaller weight placed underneath the big one, as shown in Fig. 6, held up by a horizontal spring, will also form an oscillatory system, and will be put into motion by the large weight first hitting the small weight, which, in its turn, will hit the water and produce the waves. Matters can be so arranged that the energy imparted to the small weight at each impact is sufficient to produce the maximum amount of wave without any splashing. A succession of waves will be produced, and gradually the whole of the energy originally imparted to the big weight will be converted into wave energy.

It is obvious that a necessary condition to carry out this effect is that the small weight shall always be just at the top of its path as

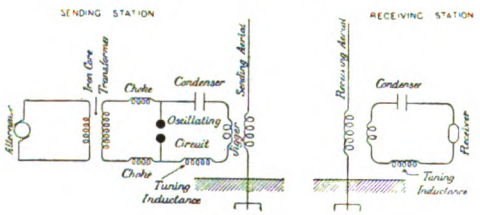


*Fig. 7.*

the big weight comes down to hit it, and it follows that the period of oscillation of both must be the same (or in harmonics)—that is to say, both oscillatory systems must have the same time-period, or, in other words, they must be tuned.

The electrical arrangement shown in Fig. 4 consists of an oscillatory circuit into which a large amount of energy can be put (corresponding to the large weight and spring in Fig. 6), and an aerial oscillatory circuit (corresponding to the small weight and spring) which receives energy from the oscillatory circuit and radiates it in the shape of electro-magnetic waves. These two circuits must have the same period—that is, must be tuned—and they are inductively connected by means of a transformer, the primary of which is in the oscillatory circuit and the secondary in the aerial circuit. This transformer is called a "jigger." The amount of coupling of a transformer depends on the relative position of the coils, and is represented by 100 per cent. at its maximum, and this degree of coupling occurs when the coils are absolutely concentric; when they are at right angles to each other the coupling is zero. When the degree of coupling is 100 per cent. all the energy (apart from losses) is transferred from the primary to the secondary in half a cycle, but as it is desired to transfer only a small portion of the energy at each oscillation from the primary to the secondary, the degree of coupling must be small. In wireless telegraphy the coupling is about 6 per cent. or even less.

Another point has to be considered in this matter, because there is a mutual interaction between the two coils the effect of which is to produce two waves, one having a smaller frequency than the free or natural frequency of each circuit, and the other a greater frequency. The two waves thus produced interfere with other stations. If, however, the coupling is loose the two waves merge practically into one, and the accuracy of tuning is much increased.

It will be realised, therefore, that by means of the two loosely coupled circuits just described a large amount of energy can be imparted to the aerial, and a succession of electro-magnetic waves can be formed.

In considering the water analogy, it was tacitly assumed that the velocity of the waves was independent of their size. This is true of electro-magnetic waves, but not of water-waves. The analogy therefore only holds good up to a certain point.

These electro-magnetic waves are radiated in all directions in the dielectric envelope 40 miles thick surrounding the earth, and the next step to consider is the means of detecting them at the receiving station. If a wire, earthed at one end and insulated at the other, called the receiving aerial, is struck by electro-magnetic waves the effect is to produce an oscillatory current in it, and an instrument called a detector or a receiver is needed to detect this extremely minute current. Marconi first used a coherer for this purpose, which was based on an effect discovered as far back as 1835 by Munk, and rediscovered by Lodge, Branly, and others—namely, that metal filings are a non-conductor until acted upon by electro-magnetic waves produced by a spark, when they become conductive. A relay could thus be put into operation, which produced the telegraphic signs of the Morse Code in the usual way by means of a Morse inker. Marconi added a "tapping" arrangement to decohere the metal particles after the receipt of each train of electro-magnetic wave. This arrangement worked satisfactorily with the plain transmitting aerial then in use, which gave a few strong waves, but the range was short, not exceeding 70 to 80 miles.

With the long train of waves produced as just described by means of a loosely coupled transformer, a cumulative effect is obtained,

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and then other classes of receivers are more sensitive; no relay is needed, and the signals are obtained in a telephone. Moreover, the receiving apparatus can be so arranged that it

*Fig. 8.*

will not respond to signals sent out with other wave-lengths to those to which it is tuned. In this way a receiving station can isolate itself from other wireless stations, and thus not be interfered with when receiving a message from its own station. Hence, by the arrangement shown diagrammatically in Fig. 7, two advantages of the highest importance are obtained—namely, greater energy distributed from the transmitting aerial and isolation.

Here, again, a mechanical analogy will be of assistance. In Fig. 8 the mechanical analogy adopted for explaining the action of a plain transmitting aerial is reproduced on the left, and on the right is a similar analogy representing the receiving aerial and coherer. The first large wave of a group hits the weight as it reaches the receiving station, and the smaller succeeding waves have an unimportant effect. The electrical equivalent is that the first electro-magnetic wave makes the coherer conducting and gives the signal, so that the succeeding waves have no useful effect and the energy in them is wasted. In Fig. 9 the mechanical analogy adopted for explaining the action of an inductively coupled aerial is reproduced on the left, and on the right is a similar analogy for an inductively coupled receiving aerial. The succession of small waves keeps the small weight system at the receiving station in a state of vibration during the whole time of their passage, and the repeated, properly-timed blows which this weight gives the large one puts the latter into motion, and thus the major portion of the wave energy is transferred to the large weight.

The electrical equivalent is that the train of electro-magnetic waves maintains oscillations in the receiving aerial, which are inductively transmitted to the oscillating circuit, and, being properly timed, the energy is accumulated therein and becomes sufficient in amount to actuate the receiver, and give signals in the telephone.

*Fig. 9.*

It will be noted that, in the mechanical analogy, unless the time-period of both the small and large weight systems is the same as that of the waves, there will be no accumulation of energy in the large weight system at the receiving station, and correspondingly in the electrical case the energy transmitted to the oscillating circuit will be insufficient to actuate the receiver. Clearly, therefore, the oscillating circuits and the aerials at the sending and at the receiving stations must be tuned to the same period, which must be the period adopted for the electro-magnetic waves.

The essence of the whole matter is that in wireless telegraphy everything must be tuned—that is to say, must be in resonance—and the apparatus must be designed for this purpose, as will be seen later.

## Progress in Ceylon.

THE wireless station in Ceylon, some particulars of which were given in THE MARCONIGRAPH of September last, is almost an accomplished fact, and the work in connection with the erection of the masts s being steadily pushed on. The site selected for the station is about the highest available spot in Colombo; the advantages of the spot are many, one of them being that it commands a vast expanse of grass fields, an important factor in sound transmission. The ground has not yet been levelled, and it will not be done until the main apparatus has been fitted up.

Two masts of steel have to be erected, 600 ft. apart, on opposite sides of the ground. Each of these masts will be 270 ft. high, these being two of the highest erected by the Marconi's Wireless Telegraph Co., Ltd. One of these masts is nearly complete. It has been erected in sections of 10 ft. A representative of the Ceylon *Observer* who visited the spot recently was greatly impressed by the way in which the mast has been fitted up. The completed portion of it stands about 100 ft. above the ground, and the workmen who work at the top have to be pulled up with the help of pulleys. The absence of any shade and the scorching heat of the sun make the work doubly trying. A beginning has already been made with the construction of the operating room. The plant and machinery had not arrived at the time of writing. The Colombo Electric Lighting and Tramways Co., Ltd., will supply the main current, but if that supply should fail the standing set at the station would be requisitioned to generate a current at the spot. This will be a great help and economy.

Apart from the operating room, which will be a comparatively small building, accommodation will be provided on the spot for the operators and the officer in charge. Mr. McAlpine will be in charge of the station when it is completed.

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# Berne Notes

**England**

The March circular of the Bureau International de l'Union Télégraphique (International Radiotelegraph Convention), Berne, notifies that all call letters commencing with the letter " I " (that is to say, from I.A.A. to I.Z.Z.), have been reserved for the use of the Marconi International Marine Communication Co., Ltd., for vessels equipped with the Marconi system of wireless telegraphy, independent of the nationality of such vessels.

✦

**United States**

The United States Government proposed to establish in connection with the American stations a system of call letters in conformity with those prescribed by the Berlin Convention. This the Berne Bureau was unable to do, because the United States had not yet ratified the proceedings of the last International Radiotelegraph Convention. The Government thereupon asked that combinations of three letters commencing with the letter " N," should be reserved for the use of the American Navy, with the exception of those letters which are at present allotted to other countries, and the Bureau invites those countries which have ratified the convention to utilise as far as possible for their radiotelegraph stations call letters other than those indicated by the United States Government. It might be added that the United States had asked to be reserved for its Mercantile Marine letters which had already been reserved for another state, and the Bureau will notify later the letters definitely allotted to the United States for this purpose.

✦

**Egypt**

The Egyptian Government have applied to the coastal station at Port Said the call letters L.P.D., in place of those which were formerly used.

✦

**Holland**

The Netherlands Government have notified the equipment with apparatus for wireless telegraphy of the steamers " Vanoverstraten " and " Vancloon," belonging to the company Koninklijke Pakketvaart Maatschappy. To the first-named vessel the letters M.K.T. have been allotted, and to the second, the letters M.K.U. A rate of fr. 0.40 per word has been fixed, with a minimum of fr. 4 per radiotelegram.

**Mexico**

It is announced that M. Maris Méndez has been appointed by the President of the Mexican Republic Director General of Telegraphs, and that he has commenced to exercise these functions.

✦

**Portugal**

The Portuguese Government has adhered to the International Radiotelegraph Convention, except for its colonies and possessions, for which it has reserved the right to exempt certain stations from the obligation imposed by Article 3 of the Convention. The Government have expressed the wish that the following colonies and possessions should be entered in the sixth class: Angola, Mozambique, Cap Vert, Guinea, the Isles of San Thomé, and Prince, Goa, Daman, Macao and Timor.

✦

**Argentine**

The Argentine Republic has decided to ratify the Berlin Convention of 1906, and the ratification is now under the consideration of the Ministry for Foreign Affairs.

✦

**Canada**

The Department of Naval Service has fixed the following charges for wireless messages through the Port Arthur Station; for the first six words, fr. 2.50; for each additional word, fr. 0.25 In the aforenamed charges, the coastal rates are fr. 1.50 and fr. 0.15 respectively. No charge is made for the address and signature.

---

The Palmario station in Italy was reopened for public service on February 17th.

✦

The *Bollittino Telegrafico Ufficiale* has unearthed from an old number of the *Osservatore Romano* of the year 1868 a remarkable letter signed by Canon Bobone, of San Remo, which appears to anticipate wireless telegraphy. The Canon stated that he had made a physical discovery hitherto unknown to any scientists; a link between separate bodies not connected by anything. He considered that telegraphy could be developed therefrom, so that communication by wire conduction would not be necessary, but he guarded himself against the charge of charlatanism by undertaking to convince all sceptics and scoffers by demonstrating trials. Whether he carried out his promised trials is not stated by the Italian paper; the principal discovery referred to has in any case not been realised.

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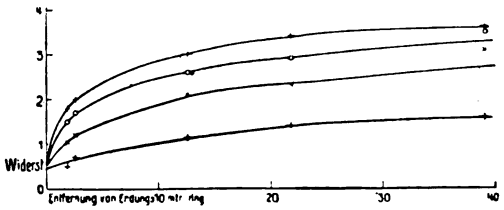
# Scientific Notes

**Aerial Oscillations.** In the *Jahrbuch der drahtlosen Telegraphie und Telephonie*, M. Reich describes some experiments made near Göttingen to ascertain the damping effect of earth currents on the aerial oscillations under various conditions, such as when the aerial was direct connected, when it was connected by capacity, the effect of altering the height of the capacity and of altering the height of the sending apparatus. The earth currents were measured by means of earth plates buried at different depths and at different distances from the foot of the aerial. Ground water was found at about 1·5 metres below the surface; the measurement of these currents is the subject of another article by H. True in




the same journal. The aerial was in the form of a horizontal equilateral triangular net, 75 metres each side, and was connected to three masts at the height of 80 metres above the ground. The capacity was formed of a similar net having a 4-metre hole in the middle of it to allow the aerial wire to pass through. The results of the measurements showed that the resistance diminished as the wavelength increased, for instance, at a distance of 39·1 metres from the foot of the aerial, the resistance was 3·6 ohms, with a wavelength of 1,030 metres, and was 1·6 ohms with a wavelength of 1,900 metres as shown in the table.

| Wavelength, metres. | Resistance. | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| 1,020 | 1·8 | 2·0 | 3·0 | 3·4 | 3·6 |
| 1,030 | 1·9 | 2·0 | 2·95 | 3·5 | 3·6 |
| 1,110 | 1·5 | 1·7 | 2·6 | 2·9 | 3·5 |
| 1,500 | 1·05 | 1·2 | 2·1 | 2·3 | 3·1 |
| 1,900 | 0·5 | 0·7 | 1·15 | 1·4 | 1·6 |

The accompanying illustration presents the results summarised in the table in graphic form. Both with direct connected and with capacity connected aerials it was found that the damping effect increased with the frequency of oscillations; it was also found that the greater the capacity the less the damping, and the higher the capacity was placed—*i.e.*, the nearer it was to the aerial net, the less was the damping.

◆

**Resonance.** It is well known that when two tuning forks of the same pitch or frequency are placed near to one another, and one is made to vibrate, the other takes up immediately the vibrational motion of the former, and emits its note, even if the first one be removed. When the pair of tuning forks are vibrating in unison, the amplitude of the sound wave is reinforced, and in any oscillatory system the reinforcement, or rapid growth, of the amplitude, due to the synchronous impulses, is known as resonance. Resonance is, therefore, a natural phenomenon of all types of wave-motion, and, in the case of wireless telegraphy, resonance is the physical phenomenon which renders the transmission and reception of messages possible. In the case of alternating current working, the conditions for producing resonance imply a dangerous condition of working, for, should the frequency of the supply voltage coincide with the natural frequency of the system, there is every possibility of an abnormal rise of pressure being produced, which may amount to several times the magnitude of the supply voltage, in which case the insulation of the system will most probably be broken down, and serious damage will result. Fortunately, it is seldom that the frequency of the supply voltage is the same as that of the system, and if the wave of the resultant current be perfectly sinusoidal, there is very little possibility of the disastrous results attending resonance occurring. It is important that every attention should be paid to the design of appliances which are intended to work on a given system, so as to avoid the production of harmonics, and it is fortunate that resistance, like inter-molecular friction, has a damping effect upon oscillations and surges by frittering away the energy produced, and so hasten the rate at which the oscillations die down.

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The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

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**ASSISTANT WIRELESS INSTRUCTOR Required.** Must be good operator and have sound technical knowledge. Apply, stating salary, to The Principal, The Manchester Wireless Telegraph Training College, Carlton House, Fallowfield, Manchester.

# Important Patent Decision in the United States

*By Transatlantic Wireless viâ Glace Bay and Clifden.)*

NEW YORK, *March 25th.*

THE Marconi Wireless Telegraph Company of America yesterday succeeded in their action against the United Wireless Telegraph Company and Clyde Steamship Company. In this action, which was brought for infringement of the Marconi Company's American patent corresponding to their well-known English patent No. 7777 of 1900, which is the master patent covering the principle of syntonisation and selectivity, and which was already part heard, both the defendants have acknowledged the validity and scope of the patent and admitted their infringement, and have submitted to judgment and a permanent injunction in favour of the Marconi Company. The 500 ship installations and the 70 land stations which had been erected and worked by the United Wireless Telegraph Company pass into the hands of the Marconi Company.

The parent company, Marconi's Wireless Telegraph Co., Ltd., also have an action pending in this country against the United Wireless Telegraph Company for infringement of Letters Patent Nos. 12326 of 1898 and 7777 of 1900, by the installation of their system on various British boats; and the defendants are about to consent to judgment in this action also, the ships carrying the British flag and fitted with the United Wireless system also passing into the possession of the Marconi Company. The effect of this decision is to confirm the famous judgment of Mr. Justice Parker, given last year in the action brought by Marconi's Wireless Telegraph Co., Ltd., against the British Radio-Telegraph and Telephone Co., Ltd., upholding Patent No. 7777 of 1900, and also to give the same value and importance to the corresponding American Marconi patent.

It is satisfactory to note that the Marconi Company have been able to legally establish the claims which they have always made for the priority of Mr. Marconi's invention in all the essential features of successful wireless telegraphy.

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## A New Record

MR. MARCONI, who is at present in America, was entertained to a banquet in a New York "skyscraper" on March 16th by the proprietors of the *New York Times*, in recognition of the splendid aid which his system of wireless telegraphy has rendered to American journals. The *New York Times* itself regularly receives from 25,000 to 30,000 words weekly by wireless telegraphy from Europe, and the success of this service is well testified by the article which appears on page 23 of this issue. The speed of the service is as much a revelation as is its cheapness, and the satisfactory way in which the exacting requirements of the Press are met is proof of the reliability of wireless. The banquet referred to was chiefly remarkable because of the ten minute wireless messages exchanged between London and New York. The time taken in getting messages through between London and New York averages about thirty minutes, the delay being due to the pressure of work upon the land lines between London and Clifden. Just to show what can be done, the Post Office authorities expedited the wires for a certain time on March 16th, and the result was, in the words of one of the newspaper correspondents in New York, "a remarkable series of new records for Marconigrams." Earl Grey "wirelessed" wishing Mr. Marconi

> "Success in the splendid endeavour to facilitate conversation between English-speaking peoples separated from each other by distance only."

Lord Blyth sent the following message:

> "Of all the wonderful discoveries the world has ever seen, surely none are to be compared with the miraculous invention of wireless telegraphy. All honour is, therefore, due to Marconi, to whom we are under a lifelong debt of gratitude.—(Signed) BLYTH."

Mr. Marconi despatched the following reply to Lord Blyth, stating the time in which the message had been received:

> "Have received your generous and too appreciative message sent through *New York Times*, which I greatly value. This message received New York from London in ten minutes.—(Signed) MARCONI."

Other messages of goodwill and appreciation reached Mr. Marconi from Lord Avebury, the Hon. Harry Lawson, and the Attorney-General (Sir Rufus Isaacs). The remarkable achievement of last week is symptomatic of the telegraph future which wireless is making possible.

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A Norwegian Order in Council has been issued providing that wireless telegraph apparatus may be imported into Norway free of duty.

## The Home of Wireless

AN important change in the *locale* of Marconi's Wireless Telegraph Company is shortly to be made. The premises in the Strand, London, formerly known as the Gaiety Restaurant, have been acquired by the company on a ninety-nine years' lease, and the work of adapting the building to the requirements of a modern place of business is now under way. It is expected that within the next six weeks the whole of the staff will once more be centralised under one roof. The company's developments during the past year have been so great that they have quite overtaken the steady increase in available office accommodation, with the result that the present step has become inevitable. The building itself is one of the finest and most prominent in London, and it will serve as an imposing reminder to the multitudes that pass along London's leading thoroughfare of the magnitude to which wireless telegraphy has developed. Nor can its proximity to Fleet Street fail to impress the newspaper owner and busy journalist of the importance of the Marconi Transatlantic wireless telegraph system, with its cheap rates and rapid services. On the ground floor of the new premises will be housed the staff of the Transfer Department, and a large telegraph office for the receipt of messages for transmission by wireless telegraphy. The waiting-room for callers will also be situated on this floor. On the upper floors the whole of the staff will be housed in offices specially adapted to suit their requirements. It is hoped to have the premises complete and everything in working order by the middle of May.

### THE NEW WORKS.

Rapid progress is being made with the new works which are being erected in New Street, Chelmsford. At these works employment will be found for several hundred additional workmen. The quantity of work in hand is a severe tax upon the present accommodation, and not only are larger premises required to cope with existing orders, but the company's expanding business renders the establishment of larger works of first-rate importance.

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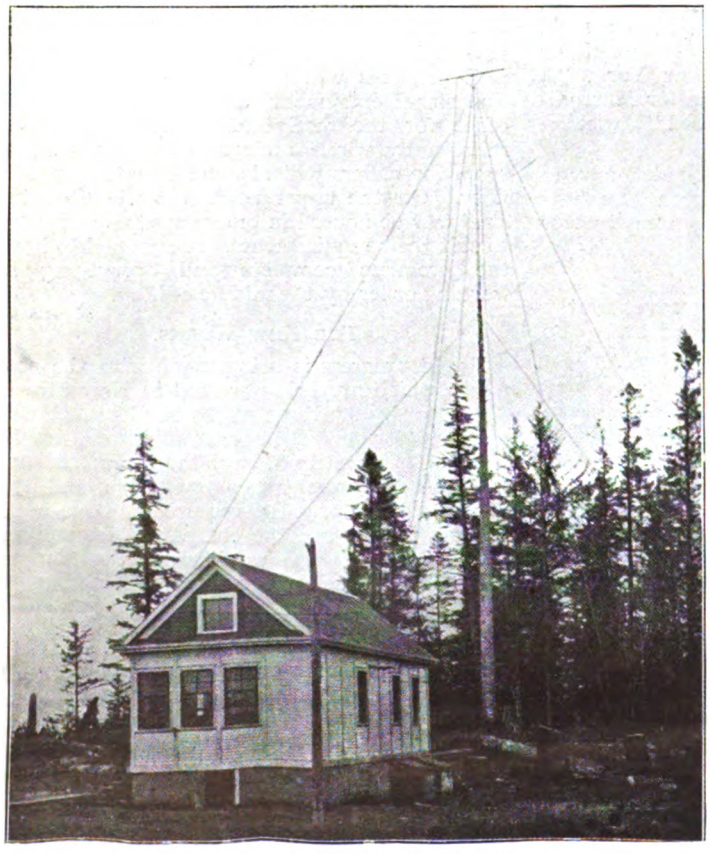
### The Share Market

The last month has been a very busy one. A settlement has taken place in the shares of the Marconi Wireless Telegraph Company, of Canada, in which very large dealings have taken place since the issue of our last number. The market in all Marconi issues has been extremely active and consistently improving. The special settlement in the lately introduced Spanish Wireless Trust, Ltd., has been fixed for April 2nd. The ordinary shares have risen to $5\frac{1}{2}$–$\frac{3}{8}$, the Preference to $4\frac{3}{4}$–$\frac{7}{8}$, New to $3\frac{7}{8}$–$1\frac{7}{8}$ (premium), Canadian 38s.–39s., Spanish $1\frac{1}{8}$–2.

# The Canadian Naval Service

**How Help is rendered by Wireless—Diminishing Trouble from Atmospherics**

BY common consent the remarkable development which has taken place in the United States constituted the most striking historical fact connected with the progress of the nineteenth century, and the lesson has not been lost upon our Canadian kinsmen. They have, in their time, experienced the drastic effects of periods of severe depression, but they have emerged from the ordeal little the worse for their vicissitude. Now that this cloud of depression has been swept away, the Canadians have become alive to the potentialities of their country. In regard to wireless telegraphy, Canada presents an important and attractive future. So much is evident from the reports of the Department of the Naval Service for the year ending March 31st, 1911. This record contains a section devoted to wireless telegraphy, in which Mr. C. P. Edwards, the General Superintendent of Government Wireless, points out that the Government owns and operates nine wireless stations on the Pacific Coast, forming a complete chain from Victoria to Prince Rupert, the range of stations varying from 150 to 350 miles. Stations were completed during the last year at Triangle Island and Prince Rupert, and a new station was installed at Dead Tree Point at a cost of 7,233 dols. Improvements were also made at the following stations—viz.: Victoria, Point Grey, Cape Lazo, Pachena, Estevan Point, and Ikeda Head of a total cost of 29,461 dols. The power of the station at Victoria has been increased to enable communications to be established with Pechena. The number of messages handled by the coast stations was 48,074, containing 647,461 words, this showing a substantial increase over the previous year. The total cost of maintenance of these nine stations was 30,864·53 dols., and the revenue derived was 3,108·63 dols. On June 1st, 1910, a commercial service was inaugurated in connection with the wireless stations on the west coast. On the east coast the Government own thirteen stations which are operated by the Marconi Company under contract (MARCONIGRAPH, August, 1911, p. 1), the range of action varying from 150 to 400 miles. These stations handled 49,339 messages during the year containing 699,151 words. The cost of maintenance was 44,524·21 dols. Stations at North Sydney and Pictou range, 100 miles, are owned and operated by the Marconi Company under contract with the Government, and handled 1,847 messages, containing



*Operating House at Cape Lazo Station*

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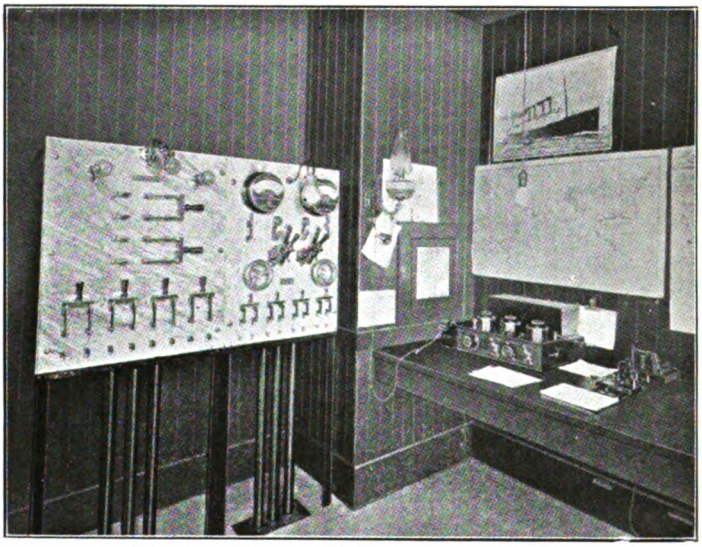
43,864 words. The cost of maintenance was 499·98 dols. Land stations are owned by the Government at Queensgate and Grosse Island, range 100 miles, and during the year a new station was installed at Magdalen Island, P.Q., having a range of 150 miles, the Marconi Company constructing the same. These stations are operated by the Marconi Company under contract, and during the year handled 5,088 messages, containing 108,623 words. The Marconi Company own and operate land stations at Montreal, 200 miles; Three Rivers, 150 miles; Camperdown, 250 miles; Sable Island, 300 miles; and handled at these stations 15,320 messages, containing 237,796 words.

During the year the wireless service has on several occasions proved of inestimable benefit to vessels in distress, communication by means of wireless having been instrumental in obtaining assistance. These figures display with remarkable force the great value of wireless telegraphy in Canada. By reference to several occurrences during the year we have the most eloquent testimony to the considerable value of wireless telegraphy in connection with casualities which occurred on the St. Lawrence route. The most important was the stranding of the "Prinz Oskar." This vessel of approximately 7,000 tons, with a large and valuable cargo sailed from Montreal on Saturday, June 18th, 1910, bound for Rotterdam, Bremen, and Hamburg. At 8.40 p.m. on Monday, June 20th, the vessel went ashore to the south-west of the Flower Ledges, Newfoundland, near the western entrance to the Straits of Belle Isle. At 8.45 p.m., the captain authorised a wireless CQD call, which was immediately answered by the Belle Isle Station, and the s.s. "Sicilian." The Belle Isle Station informed the "Prince Adelbert," which was 140 miles east of Belle Isle of the accident to her sister ship, and the captain of the "Prinz Oskar" was at once informed that the Belle Isle Station was in communication with the "Prince Adelbert." At 11.28 p.m. the "Corinthian" exchanged calls with the "Prinz Oskar" and asked if it could proceed to the assistance of that vessel. The captain, however, replied that he did not require any assistance. Continuous communication was held during the night of June 20th and the morning of June 21st with the Belle Isle, Point Amour, and Point Rich stations, also with the "Sicilian" and the "Montcalm," while messages were continually exchanged between the captain of the "Prinz Oskar" and "Prince Adelbert." In the meantime the news had been communicated to the owners, and a wreckage steamer "Strathcona" was despatched from Quebec. The people along the shore also received the news, and in consequence, the Newfoundland steamer left Blanc Sablom for Flower Ledges, anchoring near the "Prinz Oskar" at two o'clock in the afternoon of June 21st. While the position was extremely dangerous there were no passengers on board, and the captain naturally preferred to receive any assistance necessary from the "Prince Adelbert" of the same line. The latter vessel was in constant wireless communication with the "Prinz Oskar" during Tuesday, arriving alongside the Prinz Oskar" at 6 a.m., Wednesday, June 22nd, and immediately attempted to refloat the latter steamer. At 9.5 p.m. on Wednesday he succeeded in refloating the stern of the "Prinz Oskar," the fore part of the ship, however, still remaining on the rocks. Further attempts to refloat the steamer were made on Thursday, January 23rd, until 6.30 p.m., when the position of the steamer became very dangerous—the captain ordered the crew to keep the boat in readiness as the ship might have to be abandoned at any time. On the following Friday the "Prince Adelbert" succeeded in refloating the "Prinz Oskar" which immediately anchored awaiting the arrival of the wreckage steamer despatched. As the position of the "Prinz Oskar" was



*Operating Station at Prince Rupert Station*

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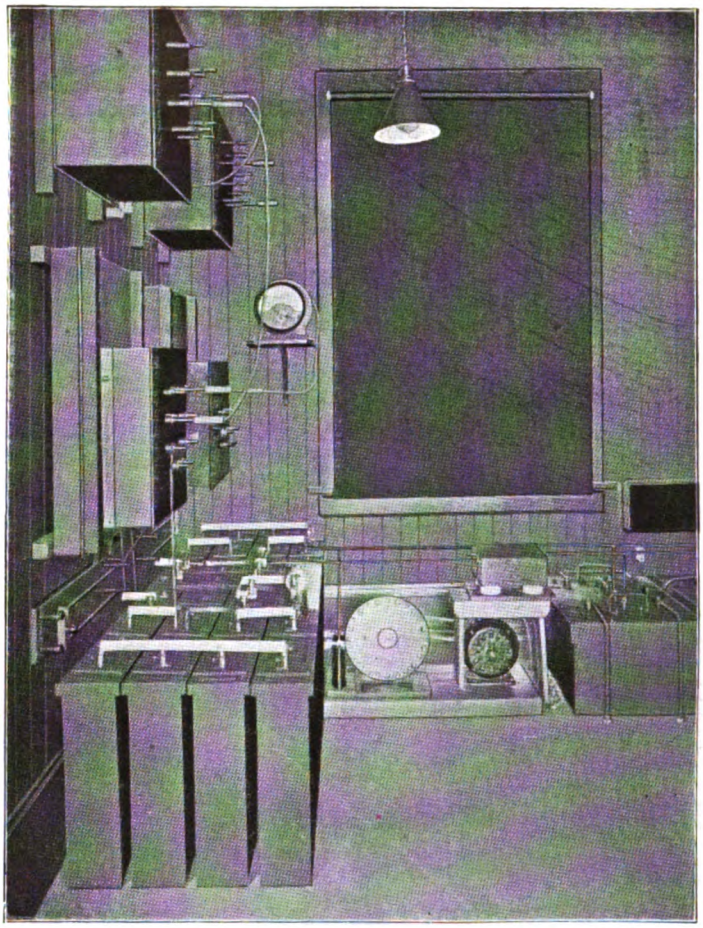

*High Tension Room and Transmitting Apparatus, Victoria, B.C.*

now comparatively saved, the "Prince Adelbert" proceeded on her way to Quebec. On Saturday afternoon, June 25th, the wreckage steamer "Strathcona" arrived from Quebec, and at 8.15 p.m. the steamer left her anchorage in company with the "Strathcona." In spite of the fact that the trip up the Gulf was a rough one, continuous heavy winds being met with, the vessel was safely escorted to Quebec, and entered the dry docks, where repairs were effected.

It is worthy of notice that immediately the steamer went aground she was in communication, not only with the stations at Belle Isle and Point Rich, but also with the steamer "Sicilian"; and that during the time she was aground she was in constant communication not only with the shore stations at Point Rich, Point Amour, and Belle Isle, but had within radius of communication at all times a minimum number of three steamers, any one of which would have proceeded to her assistance had it become necessary. There is little doubt that had the steamer remained another twenty-four hours on Flower Ledges she would have been a total wreck. The saving of the ship was therefore due to the fact that she was able to receive almost immediate assistance from another vessel which succeeded in refloating the stranded vessel within a comparatively short time, and also to the fact that notice of the mishap was given to the owners, enabling them to despatch immediately a wreckage steamer to the assistance of the stranded vessel.

The west coast stations continue to handle the weather reports of the meteorological branch of the Marine and Fisheries Department, and the service has proved very satisfactory. During the year special attention has been given to the signal service reports provided by the stations, and every effort has been made to protect the organisation in this connection. Each station prepares three times daily at 8 a.m., noon, and 6 p.m., a report containing the following information: Barometer reading, temperature, strength and direction of wind, general weather conditions, shipping sighted and time of same, and shipping spoken by wireless, location, and time of same. This report is forwarded by wireless to the Prince Rupert, Victoria, and Point Gray (Vancouver), and is kept on file at those offices. Ships equipped with wireless telegraph apparatus are practically always in touch with one or other of the stations, and the Government are thus enabled to keep a constant record of their movement. The three stations mentioned above are connected with the local telephone exchange, and all information contained in the signal service report is given to the public free of charge upon request. It is of much value to ship owners and agents, who are thus enabled to keep informed of the positions of their vessels. Advantage is also taken of same by several western newspapers which publish the reports in full in connection with their shipping intelligence. On June 1st, 1911, a commercial service was inaugurated

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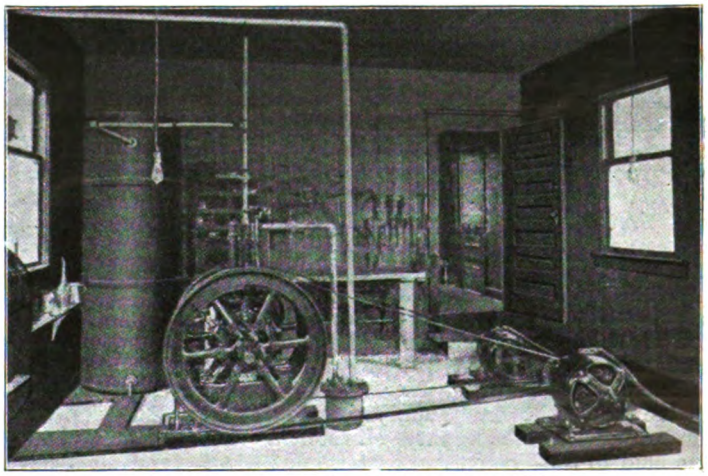
in connection with the stations on the Pacific coast. The stations now handle all business offering to and from ships, also local business between stations. The rates charged are 1·20 dols. for the first ten words of text, 12 cents for each additional word of text on all messages to and from ships, with the exception of messages to and from ships and the ship's business, on which a reduced rate of 50 cents and 3 cents is given, and on messages to and from ships on the ferry between Vancouver, Victoria, and Seattle, on which a rate of 25 cents and 1 cent is given. A twenty-four hour watch is kept on all the above stations with the exception of Ikeda Head 8 a.m. to 12 p.m., and at Three Points, 8 a.m. to 6 p.m., and the stations are instantly available in case of casualties to steamers. The wireless service has proved its usefulness in several of the latter which has occurred on the coast during the past year, of which the following are amongst the most important.

On December 2nd, 1910, the s.s. "North-Western," owned by the Alaska Steamship Company, ran ashore on Pile Point, San Juan Island, Washington. She sent out wireless distress calls which were responded to by the Government Victoria Station and the Canadian Pacific Railway steamer "Kent." The B.T. Salvage Company were communicated with, and the wreckage steamer "Starboard" sent to her assistance. January 27th, 1911, the steamer "Cottage City," owned by the Pacific Coast Steamship Company ran ashore on Cape Madge in a blinding snow storm. She sent out distress signals and her owners were communicated with by the Government Cape Lazo Station. The vessel was abandoned half an hour after striking. On the same day the steamer "Kent," owned by the Canadian Pacific Railway Company, grounded on Berkeley Sound; communication was established with Pachena, and twenty minutes after the stranding the owners were notified that assistance was despatched from Victoria, and the United States Life Saving Station at Capoosh. The vessel was floated next morning. On January 2nd, 1911, the steamer "Princess Adelaide," owned by the Canadian Pacific Railway Company, grounded on Apple Cove Point; communication was immediately established with the Victoria Station, the vessel was floated the next morning. On the following day the "Victoria," owned by the Alaska Steamship Company, ran ashore on Cape Madge. Communication was immediately established with Cape Blanco Station, and the vessel was floated without damage. Later in the day the steamer "Titania" ran ashore on Stewart Island. This steamer was not equipped with wireless, but sent a boat to the nearest wireless station to convey the news to Victoria, and the desired assistance was obtained.

The scheme laid down to duplicate the apparatus on all the stations and to keep the standard of same up-to-date with all new developments to be had has been steadily adhered to, and the following construction work has been undertaken during the year. The power of the Victoria Station has been increased to enable communication to be established direct with Pachena. One and a half acres of land adjoining the present site were purchased, and a separate 200 ft. mast erected on the same to provide at the port for an aerial large enough to work the desired business. A gasolene engine driven emergency set (6 h.p.) was installed in case of accident to the local power company's transmission lines, also a complete duplicate set of transmitting and receiving apparatus. Three acres of land adjoining the present site were purchased at Cape Lazo, and a top mast was erected on the top of a tree located on the same to provide at the port an aerial large enough to establish communication in Cape Lazo and Pachena. A type No. 3 operating house, with concrete engine bed was also installed on the new land, with a complete new 6-h.-p. plant, the old 3-h.-p. plant which was installed in the dwelling-house being dismantled and shipped to Point Grey. The work of the erection of



*Engine and Generators, Ikeda Head, O.C.I.*

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Triangle Island Station, which was commenced during the preceding year was carried to completion, including the installation of a complete duplicate plant, comprising a 6-h.-p. engine, machinery, and the necessary apparatus. The mast, which was damaged in a hurricane, was repaired. The work of the erection of Prince Rupert Station, which was commenced during the preceding year, was also carried to completion. A cable to the mainland was laid, and a line erected along the grand front pole to the City of Prince Rupert. A complete duplicate plant consisting of a 6-h.-p. engine, machines, and the necessary apparatus was installed.

The peculiar phenomena affecting the range of wireless telegraph stations on the west coast have been very marked during the past year. It has been observed that between sunset and sunrise during the fall, winter, and spring months the range of the stations both for transmitting and receiving is increased from 300 to 500 per cent. The phenomena is somewhat erratic. On some nights it is continuous, and constant communication can be maintained with another station within the same zone, but on other nights it is intermittent, and communication may be excellent for an hour, when the signal will suddenly fade away, and then after a short period come on again. It may occur several times during the transmission of one message. The greatest distance over which communication has been established under these conditions is between Triangle Island and Honolulu, a distance of approximately 2,500 miles. The daylight range of the Triangle equipment is 400 miles. Another peculiar feature in connection with the above is that while the Victoria Station is in communication practically every night with Ikeda Head, 400 miles north, 250 of which are over high land, and with the stations along the west coast of the United States so far down as San Diego, 1,000 miles south of Victoria, all of which is over high land, including the Cascade Range and the Sierra Nevada, rising to a height of 15,000 ft., no improvement has ever been noticed in the communication between Pachena Point, British Columbia, and Pretoria Point, British Columbia, 75 miles apart. No reasonable explanation for the same has yet been discovered, but a systematic observation of the phenomena is being made, and when more precise information is available there is no doubt that some satisfactory explanation will be forthcoming.

Reference is made in THE MARCONIGRAPH to the fact that on January 4th, 1911, in company with the Deputy Minister, a visit was paid to the Transatlantic Station at Glace Bay. This station, as will be remembered, is owned and operated by Marconi's Wireless Telegraph Company. The station was subsidised by the Canadian Government in 1902, and an agreement was entered into between the Government and the Company, whereby they agreed to charge not more than 10 cents per word for private messages, and 5 cents per word for Press messages transmitted between Glace Bay and a station similar on the coast of Britain. The Deputy Minister reported as follows: The signals from the Clifden Station came in about as strong as those received from the average ships stations when 150 miles distant from the coast stations, and where easily readable. A message was sent to Mr. Marconi in London, to which a reply was received an hour later. The message by which the high power is handled and the numerous automatic devices for safe guarding the apparatus, etc., reflect much credit on the designers of the station. The weak spell at dawn and sunset which were encountered when the old apparatus was in operation has been overcome, and the signals with the new apparatus are found to maintain their strength throughout the twenty-four hours. The trouble encountered with atmospherics has been very much reduced.

The Marconi Company have opened a receiving office in Montreal where messages are accepted for transmission to England at 15 cents per word. A station was erected by the Marconi Wireless Telegraph Company of Canada at Port Arthur, Ontario, in November, 1910. The company erected this station at their own expense, but under an agreement with the Department, whereby the latter may take over the station should they wish to do so. The Port Arthur Station proved its value immediately after being placed in commission.

In concluding our extract from the report of the Department of Naval Service, we can only refer briefly to the scheme that has been drawn up for the establishment of a wireless telegraph system on the Great Lake, which will include a chain of stations, approximately 180 miles apart from Port Arthur to Kingstown, with a station at Kingstown of sufficient range to communicate with Montreal, thus linking up the proposed system between each coast system, and giving frequent communication between Belle, Isle or Cape Race and Port Arthur. This scheme as contemplated would include stations at or in the neighbourhood of the following points: Kingstown (Ontario), Toronto (Ontario), Port Colborne (Ontario), Port Stanley (Ontario), Sarnia (Ontario), Tobermory (Ontario), Midland (Ontario), Sault Ste Marie (Ontario), Port Arthur (Ontario). A preliminary survey of the point has been made and sites have been secured at Port Arthur, Sarnia, Tobermory, Midland and Point Edward, Sarnia,

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## Wireless Messages to American Newspapers

THE German Cable Company (Deutsche-Atlantische Telegraphien Gesellschaft) is distressed over the successful employment of wireless telegraphy for the transmission of German news to the *New York Times*.

In an official communication reporting the apparent failure of the negotiations with the German Government for a reduced Press cable rate to the United States, "which," the company states, "is hardly to be expected for some time to come," Herr Moll, the managing director, says :

"We were aware that the *New York Times* was intimately allied with the Marconi Company, so we do not wonder at your statement that the wireless system is cheaper for you than to use the German-American cable between Berlin and New York. We would, however, call attention to the following remarks made to us by a well-known newspaper man regarding a certain New York paper :

"'The —— is a member of the Associated Press, and, of course, gets all its live news through that organisation. Without any disparagement of wireless telegraphy, for which I have great respect, it is apparent that the wireless dispatches transmitted in competition with the cable are of a class which may be published whenever received. Age neither improves nor hurts them.'"

The Berlin correspondent of the *New York Times* has taken occasion to inform the German Cable Company, in reply to its left-handed compliment to "wireless," that all the news, "live" and otherwise, which was formerly transmitted by the German cable, has been going by wireless, without delay of any sort, uninterruptedly for many weeks.

The *New York Times*, in its issue of February 27th, published the following in refutation of Herr Moll's criticism :

"It may interest Herr Moll and others to know the exact facts about the transmission of news from London to the *New York Times* by wireless telegraph. Take yesterday's *Times* (February 26th), for example. It contained 2,450 words of wireless, comprised, as sent from London, in nine separate messages, some of these messages including two or more dispatches from different places in Europe.

"The appended table records the time when each of these messages was filed in London, the time when it was received in the *Times* office, and the entire time occupied in transmission. It is to be remembered that London time is five hours faster than New York time. Thus a message starting from London for the *Times* at 4 o'clock Monday morning, London time, starts at 11 o'clock Sunday night, New York time. Considering that each message must be telegraphed over land lines from London to Clifden, Ireland, thence by wireless to Glacé Bay, Nova Scotia, and thence telegraphed over land lines to the *Times*, it will be seen that the average time of transmission, one hour and fifty-six minutes, as shown by the table, is remarkably good. It may be added that it is quite as good as the average time made by the cables so far as the *Times*' experience goes.

"Here is the record of the *Times*' wireless dispatches received between 7 p.m., February 25th, and 2 a.m., February 26th :

| No. | Filed in London. | Received by *Times*. | Time of transmission. |
|---|---|---|---|
| | | | H. M. |
| 1 | 11.40 p.m. | 7.52 p.m. | 1 12 |
| 2 | 12.00 p.m. | 8.02 p.m. | 1 02 |
| 3 | 12.20 a.m. | 8.58 p.m. | 1 38 |
| 4 | 12.20 a.m. | 9.10 p.m. | 1 50 |
| 5 | 12.40 a.m. | 9.36 p.m. | 1 56 |
| 6 | 2.00 a.m. | 11.40 p.m. | 2 40 |
| 7 | 2.50 a.m. | 12.05 a.m. | 2 15 |
| 8 | 3.35 a.m. | 1.00 a.m. | 2 25 |
| 9 | 4.00 a.m. | 1.30 a.m. | 2 30 |

Average time of transmission, 1.56.

"As for Herr Moll's intimation that only such matter is sent by wireless as would be as good one day as another, implying that a long time is occupied in transmission, any *Times* reader who sees not only the events of the day before told in the wireless dispatches, but quotations from the London papers of the same morning, knows that Herr Moll has been sadly misinformed by his 'well-known newspaper man.'"

The *New York Times*, which from the start has made use of wireless telegraphy in its Sunday foreign service, has adopted wireless telegraphy of late with ever-increasing frequency and fullness.

The best time established so far for the transmission of its wireless messages from London to New York has been an hour and fifteen minutes ; but the average speed of transmission of its wireless messages has been so good in comparison with the transmission of messages by cable under the Atlantic that the *Times* has made more and more use of the wireless ; in fact, for some time not a single cable message was sent to it from London, direct wireless service being substituted.

In addition to the wireless news from London, the *Times*' news from Paris and Berlin is sent by its correspondents in those cities by long-distance telephone to London, and thence relayed by wireless to New York. The wireless messages thus forwarded to the *Times* from Europe have often comprised more than 2,000 words daily, and 8,000 or more for Sunday, and the wireless service it has thus obtained has approximated some 25,000 words a week.

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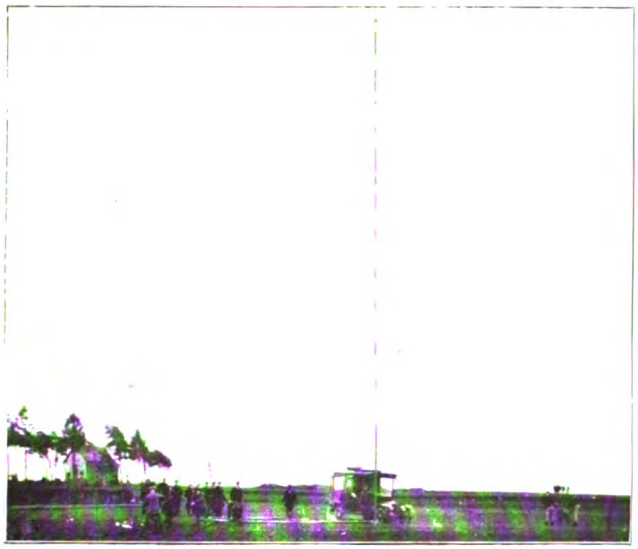
# Demonstrations of Portable Wireless Sets in Belgium

AN important series of demonstrations with portable wireless telegraph sets was conducted in Belgium during the last week in February. These demonstrations were carried out under the supervision of Major J. E. Cochrane, D.S.O., of the Marconi Co. and M. Paul de Bremaecker, of La Companie de Télégraphie sans Fil, and Lieut. Poliet, of the Telegraph Engineers Corps, in the presence, at Brussels, of General Jungbluth, Chief of the General Staff of the Belgian Army; General Dufour, and Generals Van Sprang and Georges. There were also present Majors Baltia and Cabra, and Commanders Semet and Seligman. The trials were conducted with 1½ kw. cart and car stations. On arrival at Antwerp on February 21st, a cart station was erected on a site adjoining the barracks, which had been selected by the military authorities. A car station was despatched to Brussels, and a demonstration was given to the Cadets at the military school. On February 23rd a car station was erected on a very difficult piece of land, consisting of a stonemason's yard as a site for one mast, and a ploughed field for the other, with a garden and fence between. By using wooden posts in place of pegs for the field, the station was satisfactorily erected, and communication established with Antwerp, a distance of about 45 kilometres. The signals were very strong, and the musical note gave great satisfaction. The fact that it was possible to read messages from Brussels in spite of interference from the station fixed on the barracks 500 yards away, was an advantage which impressed those who witnessed the demonstration, as it would have been impossible to read the message had not the note been distinctly musical. The station was mounted and dismounted by six Belgian soldiers in charge of Lieutenant Poliet. On Saturday, February 24th, the station was erected on a site at Namur; good signals passed to and from Antwerp, whilst



*Station Working at St. Hubert*

*Getting up the Mast at Citadel, Namur*

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the military operators were able to interchange messages with ease. At noon the Namur station called the Broomfield station in England. On February 26th communication was established between Antwerp and St. Hubert, a distance of 150 kilometers. The signals were good and clear. Belgian operators again carried out a successful interchange of messages. The apparatus consisted of the usual 1½ kw. field station set, the generating plant comprising engine, alternator, and disc discharger mounted on a common bedplate. The simplicity of the type of mast used in the demonstrations was much appreciated. The type of mast employed was a wooden sectional one, the total height being 70 ft., divided into six equal and interchangeable sections. Two such masts were employed for each station to support an aerial consisting of two wires. The adoption of this type of mast is the result of numerous experiments, and the determination to employ for military purposes only the most robust type possible.

*Mast erected at Namur*

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IN THE WEST INDIES.—In reply to a question in the House of Commons, Mr. L. Harcourt, the Secretary for the Colonies, stated that there were wireless stations in Jamaica, Trinidad, Tobago, and British Guiana, and the erection of stations in Barbados, the Bahamas, and British Honduras was under discussion.

## News from Westminster

THE ADMIRALTY AND WIRELESS.—Questioned by Mr. Peto whether, in the case of the wreck of the steamer "Delhi," owing to the wireless apparatus being calculated to send messages with a wave-length of 300 or 600, and the Admiralty stations being tuned to wave-lengths varying from 600 to 1,600, the "Delhi" was unable to communicate with Gibraltar, and communication was only made through the new (Marconi) wireless station at Cadiz, opened only a fortnight before the wreck; and what steps would be taken to make Admiralty wire less stations of use in similar cases; Mr. Churchill said the wireless messages from the "Delhi" were taken by his Majesty ships at Gibraltar, and it was not the fact that the news of the wreck was first received by the naval authorities through the wireless station at Cadiz. The International Wireless Convention provided for the differentiation between commercial and naval wave-lengths mentioned by Mr. Peto. Whenever a sufficient number of men-of-war were in company a look-out was kept by one of them on a commercial wave-length. Naval shore stations, however, had to look out on naval wave-lengths, and consequently commercial ship or shore stations would not ordinarily be able to communicate with them. That differentiation was necessary, and he did not propose to alter it. It would be possible to have an additional receiver or some additional plant at the Admiralty station so that they might be able to take messages from commercial vessels. This was only a question of money.

FOR FISHING VESSELS.—Sir E. H. Carlile asked the President of the Board of Agriculture whether he would consider the advisability of granting a subvention for the encouragement of the use of wireless telegraphy on fishing boats, and thus follow the example which had been set by the German and French Governments in dealing with boats belonging to men of their own nationalities. Mr. Runciman replied that he had no doubt there were many cases in which fishing vessels might be provided with wireless apparatus with advantage. He had, however, received no representations from those concerned in the industry.

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"Eaglehurst," Fawley, one of the most beautiful places on the Hampshire coast, has just been let on lease to Mr. Marconi, who is now in residence there.

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# Maritime Wireless Telegraphy

AMONG the ships fitted during the past month by the Marconi International Marine Communication Co., Ltd., with 1½-kw. and emergency plant are the following engaged in the Australian trade: The "Irishman," owned by the White Star Line; the "Narrung" and "Wakool," for the Peninsular and Oriental Steam Navigation Company. The s.s. "Ramos," equipped for the Amazon Cable Company, will be engaged in cable laying. The "Normannia" and "Hantonio," equipped for the London & South Western Railway Company, will be engaged in the Southampton Harbour traffic. Another vessel, equipped for the Peninsular and Oriental Steam Navigation Company, is the "Beltana," which will be engaged in trading between London and Australia; while the "Inkosi," for Messrs. J. & T. Houston, Ltd., will be engaged on the London and Beira route. Two vessels have been equipped for the Anglo-American Oil Company—namely, the "Delaware" and "Appalachee." The s.s. "Titanic," for the White Star Line, will be equipped with a 5 kw. disc set. Orders have been received from the Shaw Savill and Albion Line for the equipment of the following six vessels: "Wiamana," "Pakeha," "Rangatira," "Kia Ora," "Mamari," and "Matatua." The s.s. "Hesperides" is now being equipped with a 1½-kw. set for the Houston Line, from which company orders have since been received for the equipment of the "Hyacinthus," "Hyapathia," "Hydaspes," "Honorius," and "Hermoine." The "Ben-my-chree," "Viking," and "Empress Queen" are to be equipped for the Isle of Man Steam Packet Company. The "Wilcannia" is being equipped for the Peninsular and Oriental Steam Navigation Company, while a notable installation is that of the convict ship "Success" for the Australian Government. The "El Argentino" is being equipped for the Argentine Cargo Line, Ltd., from which company an order has since been received for the equipment of the "El Blancho." An order has also been received from the White Star Line for the equipment of the "Adriatic."

La Companie de Télégraphie sans Fil of Brussels have received instructions from the Trasatlantica Espanol to fit three of the vessels belonging to the last-named company—namely, the s.s. "Villaverde," "Cataluna," and "Cuidad de Cadiz" with ½-k.w. sets.

The Adelaide Steamship Company of Australia have instructed the Marconi International Marine Communication Co., Ltd., to equip their s.s. "Willoctira," "Warilda," and "Wandilla."

The "Dimboola," now being built at Messrs. Swan Hunter & Wigham Richardson's, Ltd., Wallsend-on-Tyne, for the Melbourne Steamship Company, will be equipped with Marconi apparatus for wireless telegraphy.

About 12.30 p.m. on January 13th, the officer of the watch on the "Osterley's" bridge (then thirty hours out of Colombo homeward bound) noticed a column of smoke hanging low over the water on the port bow. After close examination through telescopes, the ship's head was turned in the direction of the smoke, and at 1.50 p.m. it was discovered that a fine large four-masted steamer, the "Spondilous," of London, was badly on fire aft, abandoned and drifting along with the current directly in the steam lane from the Red Sea to Colombo, now a blazing beacon; but when the fire had burned itself out, to become a partially submerged derelict—a deadly menace to ships on a dark night. Her position was noted. At 7 p.m. that night, by means of a wireless service message from the Captain of "Rindjani," it was ascertained that the crew of the derelict had been rescued by the French ship "Admiral Macon," and a message giving full details was transmitted that night by the "Osterley" to Lloyd's agents at Bombay, via the station at Jask, a distance of 1,160 miles. Lloyd's were thus enabled to warn the shipping world of the existence of this danger, and at the same time the friends and relatives of the unfortunate crew were assured that all was well. If the "Spondilous" had been fitted with a small wireless set, the mail boat would have known of her condition at least 12 hours before she did, and passing the news back via her sister ship "Oksova," due in Colombo at 6 a.m. on January 12th, help might have been forthcoming from Colombo in time to save a ship worth many thousands of pounds, to say nothing of her cargo. In reality the time saved would have been more like 24 hours than 12 hours. That same night the news of the test match, with scores, played in Australia on the same afternoon, was received from Bombay, a distance of over 600 miles.

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# The Discovery of Ancient Vases at the Athens Marconi Station

By Harold Watterson

UNDOUBTEDLY the credit of the discovery of treasure trove in the land of Homer is due to the chief of the technical staff, who, from his office in London, had decided that the earth-wire system of the recently erected naval Marconi station, far away in historic Athens, must be extended.

So the plans and the letter of instruction were dropped into the box at the West Strand post office ; and a week later the chattering American tourists at Athens, who come up through the pepper groves and olive gardens to take snapshots of the 2,400 years old Temple of Theseus, glanced casually at the two hot and dusty wireless engineers who were endeavouring to translate the ideals of the London drawing-office experts to the languid Greek labourers at the wireless telegraph station which stretches its shining tentacles to the azure sky between the hill of the Observatory and the hill of Philappopos.

Greece is a peculiar country. It is a land where the dreamer of easy jobs is speedily disillusioned.

Thus, on September 16th, 1911, when we had been engaged in drilling and blasting out the crystalline limestone on which the Athens station is built, we came unexpectedly upon an ancient rock-hewn grave which contained the remains of a human skeleton and eleven beautiful specimens of the potter's art in a nearly perfect state of preservation.

*Some of the vessels found*

To the west and south-west of the Areopagus and the Acropolis at Athens rises a rocky

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ridge, divided by two depressions into three summits. It is in one of these depressions that the naval wireless telegraph station is situated, in the neighbourhood of which the grave was discovered. This part of the ancient city of Athens is unoccupied, and the whole of the rocky ridge bears innumerable vestiges of ancient settlements. Regular cuttings in the rock, flights of stone steps, terraces, wells, cisterns and channels, together with remains of houses and pieces of stucco, testify indubitably to human habitation, and in some places the lines of ancient streets can easily be followed. The root-like ramifications of the earth-wire system of the Marconi station extend far out amid these silent reminders of a forgotten and ward over his resting-place, and day by day as the sunlight waned have cast their long shadows upon him.

The grave itself, cut in the solid rock, is 6 feet 4 inches in length, 2 feet 6 inches in breadth, and a little over 2 feet deep. The appearance of the sides would seem to indicate that they had at one time received a layer of stucco. So far as can be ascertained, there was nothing to indicate the site : all inscriptions must long ago have been erased, and the workmanship of the stones covering the opening was so perfect as to render them indistinguishable from the living rock.

The firing of a dynamite cartridge for the purpose of removing an obstruction accidentally

*Silent Reminders of a Past Civilisation*

civilisation, and terminate at the ruined wall which once extended from Athens to the Piræus.

The position of the newly-discovered tomb is quite near to the famous sloping rock near the little Byzantine church of the *Hagia Marina*. The surface of the rock is worn smooth at the south-east angle, as a result of an extraordinary superstition that sliding down it brings good luck.

Those who have travelled in Italy and the East are familiar with the ancient custom of burying the dead outside the city walls by the roadsides, and this was doubtless the case with the forgotten Greek who has lain in his rocky tomb for so many centuries, whilst the statues of the maidens on the Acropolis have kept watch

revealed the presence of the tomb, happily without injuring seriously its contents. It is evident that outside air must have had access to the tomb, for of the skeleton itself little save the skull remains, and that is in a most fragile condition.

The skull is that of an old man—probably over eighty years of age at the time of death. All the teeth in the upper jaw are missing with the exception of four, and those that remain are in a much worn state. The lower jaw likewise has but four teeth, which also have seen much service.

But the chief interest, of course, centres round the funeral vases which had been interred with the corpse. On either side of the heaa was a beautiful and massive flat-topped terra-

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cotta oil vase or *amphora*, fitted with a lid. The bodies of these *amphoræ* are coated with a hard black composition, and the tops are ornamented in conventional patterns, the colours of which are as fresh as on the day when they issued from the painstaking hand of the artist. The material is a fine, hard and very heavy terra-cotta. The insides of the vases are very curious: a thin circular division extending from the rim almost to the bottom of the receptacle, thus forming a double interior chamber.

*The Skull and Vases found in the Grave*

Close to the *amphoræ* were found two small Ionic funeral vases of Tanagra ware and most beautiful workmanship, covered with elaborate designs in line, showing a high degree of artistic skill, one being a profile representation of the head of Medusa—a perfect and lovely face. Some pigment has been mingled with the fine clay, giving to the cheek of the subject a warm, red tint which suggests in a remarkable manner the soft, rounded contours of youth.

On the left side of the corpse was a slender red terra-cotta perfume jar, ornamented with the figure of Sappho, who leans against a slender column. This jar collapsed into fragments when touched, but has since been reconstructed.

At the right-hand side of the dead man a larger painted vase and a black glazed pitcher had been placed. This vase, which is 8 inches in height, is a veritable treasure of archaic ceramic art. Upon one side is a representation of a goddess playing on the lute, and accompanied by two satyrs. On the other side are the figures of two maidens.

The painting of the goddess is peculiarly charming. The face is seen in profile, and the lips have a pleasant expression, whilst the coiffure is most elaborate. The bodily form is very successfully suggested beneath the drapery, which is white, as is also that of the maidens on the opposite side of the vase. The two nude satyrs are shown capering beside the aristocratic figure of the goddess, who advances with short and dignified steps.

The remaining five vessels are small tearvases of various sizes, and had been laid at the feet of the departed. They are of yellow terra-cotta, embellished with representations of birds and animals, some in colours. One is remarkable for a lifelike picture of a charging boar.

An examination of the accounts of the development of early Greek vase painting, and a comparison

*The Double Spark at Athens Station*

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of the vases found in the grave at the Marconi station with the specimens in the museum at Athens, leaves no doubt that the vessels brought to light so strangely belong to the middle of the sixth century before Christ, and are products of the school founded by *Epiktetos*, which prepared the way for the younger group usually named after *Euphronios*, the activity of which extended down to the beginning of the fifth century before Christ. The vases, although possessing great interest from the point of view of the student of archæology, were not of the most expensive type. The portion of the ancient city of Athens near which the grave was discovered was given up to the trading and artisan classes of the community, and this leads us to deduce that the tomb was that of a well-to-do man of the middle classes.

It is difficult adequately to describe one's sensations on stumbling upon these gems of ceramic art, which have remained undisturbed in their rocky hiding-place for two thousand five hundred years. A visit to a museum, with its methodically-arranged rows of vases and classified cases of objects, does not bring before one's mind the circumstances and scenes with which the objects were associated, but to make such a discovery as that which has fallen to our lot is different. It brought before one a tremendous sense of the reality of history. The thought occurred on looking at the skull and the funeral ruins, "This old man really lived. Lived and died under the shadow of the Parthenon, ages ago, before the Christian era, and before the British Empire was thought of." And the long vista of the centuries fades, and one finds oneself picturing quite easily the life and surroundings of that long-forgotten Athenian citizen.

The deep blue sky and sparkling sea and Homer's rocks and sun are the same, and the Acropolis towers above us, not, as now, in ruined magnificence, but glittering in all the glory of dazzling white Pentelic marble and carven tracery. But our Greek never lived to see the colossal statue of Athena Parthenos which in later years dominated the sacred enclosure of the Acropolis, her golden helmet forming a land-mark for lonely mariners far out at sea.

The silent ruins change to busy streets thronged with hurrying artisans; criers shout their wares, and the charcoal fumes from the brass-workers' forges mingle with the appetising aroma from the cook-shops.

Solon is despot at Athens, and under his beneficent rule the young Greek pursues his studies with the same avidity for learning which characterises the Greek scholar of to-day. His studies include rhetoric music and dancing, and the works of *Alcman*, the Spartan slave poet, would be amongst the earliest things that he was taught. He would know by heart such stanzas as:

"Now o'er the drowsy earth still Night prevails,
Calm sleep the mountain tops and shady vales,
The rugged cliffs and hollow glens;
The wild beasts slumber in their dens;
The cattle on the hill. Deep in the sea
The countless finny race and monster brood
Tranquil repose. Even the busy bee
Forgets her daily toil. The silent wood
No more with noisy hum of insect rings;
And all the feather'd tribes, by gentle sleep subdued,
Roost in the glade, and hang their drooping wings."

As well as the writings of *Arion* and *Stesichorus*. Later one sees him taking his part in the political discussions in the *Syntagma*, and making his solemn pilgrimages to the sacred Acropolis, where dwelt the goddess Athena herself in the House of Erectheus; the holiest of holies in pagan religion, a temple of dazzling white, adorned with statues supported on slender columns; wonderfully beautiful, projected against the deep blue of southern skies—a work in which the deity was to rejoice as she rejoiced in the maidens that came to her festivals.

*The Skull found at the 2,500 years old Sepulchre*

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One pictures our Greek again, married and with a growing family, engrossed in the cares and occupation of a trader's life, and as time passes, in middle age, prosperous, bald-headed, and already showing traces of the corpulency which the climatic conditions of Greece render inevitable, the while his country becomes the centre of the intellectual activity of the world.

The moving finger writes ; the years flicker past ; his sons conduct the old man's business,

*The Ruined Grandeur of the Acropolis.*

and as he takes his evening walk upon the hill of Philáppopos we see that his steps are grown feeble, and that he leans upon his staff. And so we come to the saddest of all domestic scenes, and stand with the grief-stricken relations and friends round the open grave upon the sun-soaked hillside, whilst the priests chant their solemn prayers and commend the soul of the departed man to Hercules the Conductor and Jove the Protector of the Dead, and perform the ritual of placing in position the funeral vases.

So, his race well run, our Greek sleeps secure through the Persian invasion and the thirty-eight years of the Pelopponnesian war. Now his children are white-headed—grandparents . . . he himself is forgotten ; kingdoms rise and fall ; Athens reaches her glorious zenith and declines, the Roman conqueror holds her in a grip of steel, and Greece becomes a Roman province.

The mighty Roman empire, that empire which collected within the walls of her imperial capital all the elements of ancient culture, and has preserved them for posterity, totters and collapses ; and the fair land of Hellas is ravaged by the barbarians, the Avars, the Slavs, the Norwegians and the Varangians. Then come the Crusaders, with holy zeal and lust for loot. A thousand years of slavery under Venetian and Turk follow, and, behold, Greece arises from amid the imperishable remains of her thousand temples, and a new Athens shines white and splendid upon the plain of Attica, with merchant vessels trading to distant lands, and stately ships of war guarding her sunlit shores.

. . . . . .

Two men, engineers from the north, heirs to the knowledge of the ages, and descendants of those savages that peered in amazement over the cliffs of Kent at the advent of the armada of the Roman general Julius Cæsar, when the glory of Greece had faded to a legend, these men come by chance upon that old Greek grave cut in the hillside, and gaze and marvel at the evidences of the mystery of Time and Life.

A booming, crashing sound fills the air : the ground vibrates. It is the organ-note of the great spark at the wireless station sending out the noonday hour to the cruiser squadron somewhere out there amid the vine-clad Ionian isles set in the sapphire sea. Sixty-four thousand every minute—the sparks stream out in unbearable brilliance, and we come back with a click to the year of grace *anno domini* nineteen hundred and eleven.

"Good tone to-day," says my colleague, putting down the vase he has been examining, and listening intently. "I think we might shift that phase position a little though. Come on !"

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## Personal

The Postmaster General has appointed Major O'Meara C.M.G., R.E., to be Engineering Special Commissioner to examine and report upon the telegraph and telephone systems of Europe.

Mr. W. Slingo, one of the two Assistant Engineers-in-Chief, has been appointed Engineer-in-Chief in succession to Major O'Meara.

Mr. J. Lindsay, the chief officer at the Lizard wireless telegraph station, has been transferred to a similar post at Cullercoats, Northumberland. He was appointed to the Lizard Station, under the Marconi Company, ten years ago, and at the end of three years was promoted to his present rank. For some time Mr. Lindsay was a Parish Councillor, whilst he was one of those who were instrumental in obtaining a recreation ground from Viscount Clifden. Before he left the Lizard friends presented him with a dressing case. Mr. Close, one of his assistants, is accompanying him to Cullercoats, and Mr. Price will act as chief officer at the Lizard, to which station also Mr. John Reynolds has been transferred from the Bolt Head station.

## Athletics

A meeting of the members of the Marconi Athletic Club was held on March 18th, when the following committee was elected: Messrs. H. W. Allen, W. W. Bradfield, C. F. Burden, A. Cappelaere, A. G. Cutts, A. Flood-Page, A. Gray, T. E. Hobbs, C. J. Ketteridge, F. J. Menier, and —. —. Richardson. Mr. W. R. Cross was elected Treasurer, with Mr. W. H. Smith and W. Collup, Secretary and Assistant Secretary respectively. The matches arranged to take place by the football section are, on April 6th, against Bessborough United on the home ground at Lower Sydenham, on April 13th the return match will be played at the Boston Road ground, Ealing, W., whilst on April 27th, a match will be played against Baynards F.C. A swimming section has been formed, and intending members are requested to hand in their names to the Secretary. Mr. W. W. Bradfield and Mr. C. J. Ketteridge are respectively Captain and Vice-Captain of the cricket team.

## Movements of Engineers

F. A. Hart, from Head Office to Laboratory.

J. A. Proctor resigned.

H. J. Round, C. C. Chapman, and H. E. Watterson have arrived at Manaos.

E. J. Watts has arrived at Shanghai.

F. E. Burrowes is in charge of the erection of a new station at Stanley, in the Falkland Islands.

H. Dobell has gone to Vigo to conduct special tests.

F. Post is on his way home from Tarakan.

O. Trost has gone to Copenhagen to fit the Danish cruiser "Absalon."

E. G. Tyler is in charge of the alterations to the post office wireless station at Niton, Isle of Wight.

R. K. Rice has finished the station at Colombo, and will shortly return home.

J. J. Leary is in charge of the reconstruction of Poldhu station, assisted by C. H. Keith, R. H. Strickland, and H. Nicholls.

J. G. Robb is in charge of the directional apparatus which is now being tried on board s.s. "Mauretania."

R. V. Ridges and F. C. Lunnon have gone to Clifden.

S. L. Dashwood and S. R. Grover will return from India by s.s. "Mombasa," sailing on April 11th.

G. S. Wood and W. F. Fielding, having completed their course of instruction at Broomfield, are now on the ship-fitting staff.

## Movements of Operators

The following transfers of operators in the employ of the Marconi International Marine Communication Co., Ltd., have taken place during the past month:

G. Balding, from the "Walmer Castle" to the "Minnehaha."

J. H. Golding, from the "Arawa" to the "Wakool."

G. Thomson, from the "Oceanic" to the "China."

J. G. Phillips, from the "Oceanic" to the "Titanic."

E. Ogilvie, from the "Minnewaska" to the "Mantua."

W. Haywood, from the "Galician" to the "German."

F. R. Yeo, from the "Oronsa" to the "Moravian."

J. A. Craigie, from the "Afric" to the "Canada."

C. M. Allnutt, from the "Antony" to the "Augustine."

J. Moody, from the "Belgic" to Clifden Wireless Station.

H. J. Belcher, from the "Campania" to the "Galician."

S. C. Howes, from the "Denis" to the "Saxonia."

J. Connell, from the "Empress of Britain" to the "Mauretania."

G. Hake, from the "Empress of Britain" to the "Orita."

A. J. Osborn, from the "Gloucestershire" to the "Denis."

S. Stansbridge, from the "Orita" to the "Bohemian."

A. C. Arnold, from the "Baltic" to the "Winifredian."

A. C. Baker, from the "Winifredian" to the "Corinthic."

T. Knox, from the "Dominion" to the "Athenia."

G. F. Pepper, from the "Devonian" to the "Pretorian."

H. Hayes, from the "Montfort" to the "Irishman."

J. Starkey, from the "Mendi" to the "Virginian."

H. Sturdy, from the "Oravia" to the "Montreal."

E. E. Learnian, from the "Pancras" to the "Royal Edward."

W. J. Cotter, from the Marconi School to the "Virginian."

H. J. Lightfoot, from the "Ambrose" to the "Antony."

J. T. Griffith, from the "Megantic" to the "Afric."

A. C. Lund, from the "Pannonia" to the "Akabo."

F. A. Bradley, from the "Canadian" to the "Inkosi."

A. L. Henri, from the Marconi School to the "Cymric."

T. J. Chapman, from the "Derbyshire" to the "Gloucestershire."

S. H. Devereux, from the Marconi School to the "Devonian."

A. Crofts, from the "Empress of Ireland" to the "Appalachee."

J. L. Lambert, from the Marconi School to the "Empress of Ireland."

H. E. Solway, from the "Teutonic" to the "Hesperian."

H. A. Flick, from the "Hesperian" to the "Ivernia."

K. S. Cowley, from the "Rewa" to the "Lusitania."

H. Kirby, from the Marconi School to the "Megantic."

G. McCormack, from the "Munster" to the "Ulster."

J. R. Thomson, from the "Cymric" to the "Oravia."

### American Company

G. H. Rabbitts, from "Sagaponack" to the s.s. "Rosalind."

H. Williams, from the "Olinda" to Wanamakers' New York station.

Roland T. Crane, from "Sagaponack" to s.y. "Warrior."

R. M. Fennell, from the s.s. "Curityba" to s.s. "Rosalind."

Fred. E. Heiser, from So. Wellfleet to Sea Gate.

Jos. H. Hughes, from "Sagaponack" to Wanamakers, New York.

Harry E. Kent, appointed to s s. "Olinda."

F. A. Nelson, appointed to Cape May.

T. E. Nivison, from Cape May to So. Wellfleet.

M. H. Payne, from Sea Gate to Head Office (New York).

G. B. Rabbitts, from s.s. "Rosalind" to to s.s. "Curityba."

H. Williams, from Wanamakers (New York) to Sea Gate.

Walter Zipfel, appointed to "Sagaponack."

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THE
# MARCONIGRAPH

Vol. II.—No. 14. May, 1912.

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Price 2d.
Post Free 3½d.

## A Great Marconi Scheme

**Direct Communication Between London—New York; New York to the Far East and to South America.**

**Important Agreement with America and Canadian Land Line Companies.**

ONE of the most important announcements ever made in connection with the world's telegraphic systems was made on April 18th. This announcement was to the effect that Marconi's Wireless Telegraph Company had made arrangements with the Marconi Wireless Telegraph Company of America to construct for that company a number of long-distance wireless stations, and that the two companies had signed a working agreement with the Western Union Telegraph Company of the State of New York, and with the Great North-Western Telegraph Company of the Dominion of Canada, which provides that the Marconi companies shall have the full benefit of the Western Union and the Great North-Western Telegraph Companies' land line stations for the receipt and delivery of their messages throughout the United States and Canada upon the most favourable cable rate terms. The agreement provides that the Marconi Company shall affix a Marconi signboard to all offices of the Western Union Company. The Western Union and the Great North-Western Telegraph companies have in all about 25,000 telegraph offices throughout the United States and Canada.

The importance of the agreement above referred to lies in the fact that the Western Union Telegraph Company and the Great North-Western Telegraph Company of Canada, with their numerous offices, automatically become feeders of the Marconi system. The charge per word for Marconigrams from London to New York will be 7½d., and when the arrangements are completed it should be possible to communicate from London to New York in five minutes.

The Marconi companies are about to erect new long-distance wireless stations providing direct communication between New York and London. The mere mention of this great undertaking is enough to raise wonder; it is a proposition which, upon reflection, will strike the mind of the reader as one of unparalleled importance and as one of the most stupendous undertakings in the history of communications. Not so long ago such an idea was ridiculed; soon it will become one of the commonplace achievements of the Marconi Company. It does not stand alone, however, in the programme of the American Company, for preparations are in hand for the construction of a number of stations to give communication with the East from San Francisco to the Hawaiian Islands, the Philippines, China, and probably Japan.

The American Company's programme further provides for a second long distance station to be erected in the immediate vicinity of New York to communicate with Cuba, Panama, and South American countries. We must leave to our next issue a more detailed account of this undertaking, so inspiring in its magnitude and beneficial in its prospects.

The shareholders of the Marconi Wireless Telegraph Company of America passed on April 18th a resolution in general meeting to increase their capital to $10,000,000 in shares of $5 each in order to enable it to complete its enterprise.

The American Company is registered under the laws of the State of New Jersey, in accordance with which the shareholders have the first right to apply for any increase of capital.

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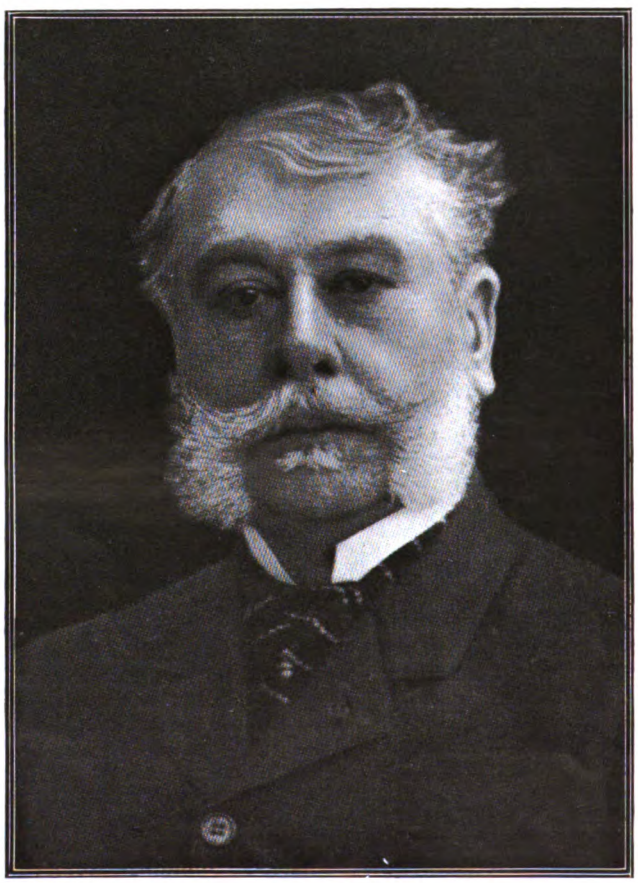

M. JULES CHARLES-ROUX

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# M. Jules Charles-Roux

## Director of the Compagnie Française Maritime et Coloniale de Télégraphie Sans Fil (French Marconi Co.)

STATESMAN, author and business man; under each of these categories would the subject of our sketch this month fill a distinguished niche. Born at Marseilles on November 14th, 1841, M. Jules Charles-Roux received his education at the Lycées of Marseilles and of Paris. From 1860–1864 he took a course at the Faculté des Sciences, at Marseilles, under Professor P. A. Favre. At this early date M. Charles-Roux showed signs of great literary ability, which found outlet in the publication of several scientific books dealing with the subject of the substances used in the soap industry. M. Charles-Roux early identified himself with the commercial and municipal life of his native city, having been member of the Chamber of Commerce from 1880 to 1889 and Municipal Councillor from 1886 to 1888. In the latter year he was appointed *Adjoint* to the Mayor. He was for three years Councillor General of the Bouches du Rhone, which department he later represented in the Chamber of Deputies.

One would suppose that these activities would naturally fill the life of a man. Not so with M. Charles-Roux, however, who found satisfaction for his artistic tastes and scientific attainments in his association with the Cercle Artistique and the Société des Amis des Arts and the Geographical Society of Marseilles. While a member of the Chamber of Deputies, between the years 1889–1898, M. Charles-Roux was a member of the Customs and Budget Commissions. In 1894 he was Reporter of the Budget of the Ministry for the Colonies, and three years later Reporter of the Budget for the Ministry of Commerce. In 1898 he was elected Vice-President of the Budget Commission and of the Colonial Group. During this period he delivered numerous discourses on tariff, colonial, labour, financial and mercantile marine questions.

Anything like a complete list of the honorary offices which M. Charles-Roux has filled would be impossible to give in the space at our disposal, but they range from Vice-President of the French Maritime League to that of President of the Union Coloniale Française. In addition, he has filled the office of President of the Société Marseillaise, Director of the Banque de France, Director of the Sugar Refineries of Saint Louis and of the Franco-African Society. He is President of the Council of Surveillance of the Marseilles Steam Navigation Company (Fraissinet et Cie.), the oldest steam navigation company in France, his paternal grandfather being one of the founders of the firm, in which M. Charles-Roux obtained his early experience in ship construction. He is President of the Compagnie Générale Transatlantique, one of the most important shipping companies in Europe, Vice-President of the Suez Canal, as well as Director of the Comptoir National d'Escompte, of Paris; of the Compagnie des Chemins de Fer Paris-Lyon Mediterranée, and President of the Land Bank of Egypt.

In 1865 he was a member of the Commission appointed by the Marseilles Chamber of Commerce to examine the work of cutting the Suez Canal, and he was present at the inauguration of the Canal. He also represented his country on the Commission which went to South America in 1886 in connection with the Panama Canal, and he has paid numerous visits to Belgium, Holland, Germany and Great Britain to report upon the harbours, docks and ports.

M. Charles-Roux has published numerous articles in the leading French economic and political reviews. His book entitled "Notre Marine Marchande" was awarded a prize by the Academie des Sciences Morales et Politiques. A larger work, published in 1901, dealing with the Suez Canal, won an award from the Academie Française.

M. Charles-Roux has also published a number of works on the archæology and history of Provence. At present he proposes to complete his studies upon "La Provence," and to publish monographs on ancient Marseilles, the Abbaye of Saint Victor, Arles, Tarascon, Beaucaire, Avignon, Orange, Vaison, Montelimar and the Château de Grignan. He has also in contemplation works dealing with the ruins of the Valley of the Rhone, Toulon Hyères, les Arcs.

He holds the following decorations: Commandeur de la Légion d'Honneur, Officier de l'Instruction Publique, du Mérite Agricole, Commander de Léopold de Belgique, du Christ de Portugal, du Danebrog, Grand Officier de Saint Stanialas de Russie, de l'Ordre de Charles Trois de Monaco, de la Couronne de Prusse, Grande Croix de Divers Ordres Coloniaux, etc.

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# An Epic Tragedy of the Sea

## Wireless—The Wonder Worker

ON Wednesday, April 10th, the "Titanic" left Southampton replete with all the luxuries that engineering science, commercial organisation, and nautical skill could provide. Five days later she sank to the ocean bed, a useless mass of lumber. She went forth an emblem of man's achievements won from the mighty forces of nature; she lies now in the silence of her gloomy grave, a warning to man's arrogance. In every sense but one this mighty vessel was a "Titan"—a veritable god among the members of her craft; but in the very sense in which she was not a god she was the symbol of human impotence. The world had reluctantly to accept that the "Titanic" had sunk. In the dark hours between the setting of a Sunday's sun and the dawn of Monday, April 15th, the "Titanic" met an icefield which had floated down from the Arctic Sea. The presence of ice there at this time of the year was unusual, but other Atlantic steamers had met the same field and passed through it—not all without damage. It probably was the misfortune of the "Titanic" to have run upon a berg in advance of the main field, and the damage done by the impact was sufficient to send to the bottom of the sea a vessel proclaimed to be unsinkable. All accounts agree that the night, though moonless, was starry, that the atmosphere was unusually clear, and the sea absolutely calm when the disaster occurred. The majority of the survivors note with surprise the slightness of the shock, a fact which corroborates apparently the well-substantiated report that the "Titanic" did not strike an iceberg "head on." The shock caused practically no alarm amongst the passengers, though one of the surviving stokers is reported to have said that the water immediately poured into the stoke-hole. It was not until the engines stopped a moment later that any disquiet was felt. Even then there was absolutely no panic. The belief in the unsinkability of the "Titanic" was firmly rooted, and an idea was apparently current that an iceberg had been merely grazed. The order, "All passengers on deck with lifebelts on," came about half an hour after the collision, and the sailors almost simultaneously began to prepare the boats.

Like a Phœnix from the fire there arises from the gloom of this disaster two incidents, one which displays the noblest qualities of the Anglo-Saxon race, and the other a glorious record of the beneficent part which wireless telegraphy plays at sea. The scene in which wireless played its heroic part, and brought succour to those who had escaped from the sinking ship, is vividly described in the words of the surviving wireless operator of the "Titanic," Mr. Harold Bride. Mr. Bride was the second operator on this vessel, and was relieving his chief, Mr. J. G. Phillips, at the time when the collision occurred. "I was standing by Phillips telling him to go to bed, when the captain put his head into the cabin. 'We have struck an iceberg,' he said; 'you had better get ready to send out a call for assistance. Don't send it until I tell you.' The captain went away, and in ten minutes he came back. We could hear terrible confusion outside, but not the least thing to indicate any trouble. The wireless was working perfectly. 'Send a call for assistance,' ordered the captain. 'What call shall I send?' Phillips asked. 'The regulation international call for help—just that,' was the reply; and Phillips began to send the signal 'C.Q.D.,' joking whilst doing so. After a few minutes, however, the captain reappeared, and said, 'Send S.O.S.; it may be your last chance.' The 'Carpathia' answered our signal, and we told her our position, and said we were sinking by the head. The operator went to tell the captain, and in a few minutes returned and told us that the 'Carpathia' was putting about and heading for us." The "Carpathia" reached the scene of the wreck at 4 a.m. on Monday, and took on board all the passengers who were in the boats. In a little time the "Olympic," "Baltic," "Virginian," "Parisian," and other vessels were apprised of the disaster by means of wireless telegraphy, and communication was at once established with the shore, and the world then heard of the epic tragedy of the sea.

What may have happened had the "Titanic" not been fitted with wireless installation is too horrible to contemplate. Collisions with icebergs in the past have been fatal to many good ships. The loss of the "President"

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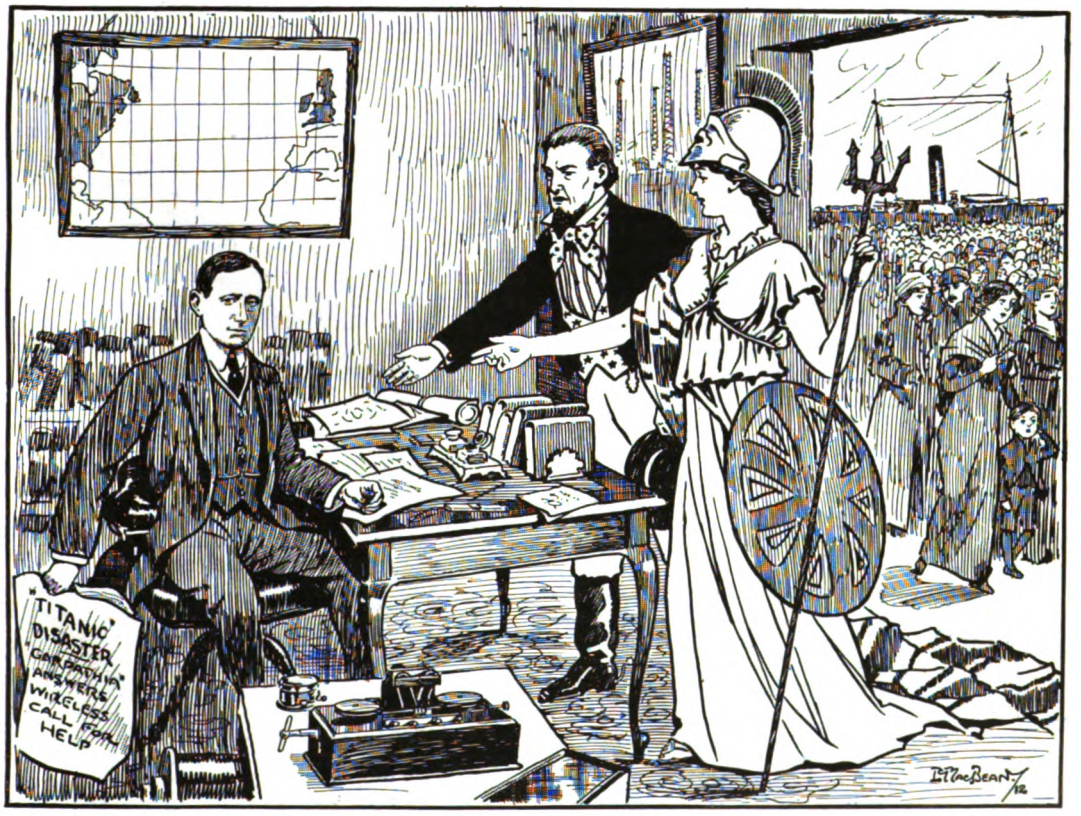
and the "Pacific" in the earlier days of Atlantic navigation is ascribed to this cause, though no one lived to tell the tale. But in the case of the "Titanic" the wireless installation which she carried enabled her instantly to call up help.

The nation's gratitude for the wonderful means which have enabled this to be carried out is adequately expressed in the following extracts from the British Press:

"We owe it to patient research in a delicate and difficult branch of science that the 'Titanic' was able, with wonderful promptitude, to make known her distress, and to summon assistance. But for wireless telegraphy the disaster might have assumed proportions which at present we cannot measure; and we should have known nothing of this occurrence for an indefinite period. Many a well-found ship has, in fact, disappeared in these berg-haunted waters without leaving a sign to indicate her fate. Thanks to Marconi's apparatus, it is now hardly possible for any vessel equipped with even moderately powerful instruments to be lost on any frequented route without being able to communicate information and to summon help. The 'Titanic' had the call upon a circle of at least three hundred miles radius even in daylight, while at night the range of her instruments would be doubled or trebled. She could speak to the shore and to every vessel over that enormous area of ocean, and she could be spoken to and assured that help was on the way. Not only so, but the ships appealed to could communicate with one another, act in concert, and transmit the news to indefinite distances. The advantages conferred by this abridgment of space are enormous. No vessel need be alone, none need vanish without a sign from human ken, and in none but crushing and instant disasters need any despair of help. This is surely one of the greatest of the many boons conferred upon humanity by patient, persistent and often




"THOSE WHO HAD BEEN SAVED, HAD BEEN SAVED THROUGH ONE MAN—MR. MARCONI

Extract from a speech by the Right Hon. Herbert Samuel, the Postmaster-General, on April 18th

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very discouraging inquiry into natural laws, carried on, at all events in its initial stages, by students animated only by love of knowledge. Marconi shares are now well known on the Stock Exchange, and wireless telegraphy is a huge commercial undertaking, but few besides experts have the faintest conception of the difficulties to be overcome, or of the mental and moral equipment needed to overcome them, when the hints are few and obscure, when every instrument has to be called out of the void, and when hope of gain, if considered at all, was infinitely remote."—*The Times*, April 16th.

"The imagination is struck once more by the wonderful part played by wireless telegraphy in the story of the 'Titanic.' The wounded monster's cry of distress sounded through the latitudes and longitudes of the Atlantic, and from all sides her sisters, great and small, hastened to her succour. But for this new instrument of communication it might have been that the greatest product of naval architecture would have passed from our human ken her fate for ever unknown, or unknown at least until one or more of her boats struggled to the Newfoundland shore. . . . The wonder of the wireless is once more demonstrated. We recognise, with a sense near to awe, that we have been almost witnesses of the great ship's death agony."—*Pall Mall Gazette*, April 16th.

"With this means of communication (wireless) the terrible isolation of mid-ocean has vanished for ever. Her appeal for aid was received by half a score of ships and taken in by the nearest land stations. From the moment when it was made her passengers and crew had the comforting knowledge that help was coming up from all quarters. Every ship within range hurried to her assistance, but it was impossible to avert loss of life."—*Daily Mail*, April 16th.

"Even while the great liner was reeling back from the shock of the fearful impact the Marconi operators were at their places, and those poignant appeals for help—mute, invisible—were flying outwards on their instantaneous errand. The 'Virginian,' steaming through the darkness 170 miles away, noted the call and instantly turned to the rescue. The 'Olympic' picked it up, and the bells rang, too, in the telephone-room of the 'Baltic,' 200 miles below the horizon. . . . There is a new sense of the value of the wonderful invention which was able to summon aid when aid could have been obtained in no other way."—*Daily Telegraph*, April 16th.

"Never before has the romance of wireless been brought so vividly to the imagination of two hemispheres as by the news reporting the disaster of the 'Titanic.' Who could fail to have been thrilled by the brief word pictures of the 'Carpathia,' the 'Virginian,' the 'Olympic,' the 'Baltic,' and other great transatlantic liners speeding hundreds of miles across the waste of waters to their sister ship in her hour of need?"—*Manchester Weekly Times*, April 20th.

"But for the wireless what would have been the state of the unfortunate people wrecked? They might have drifted about for days looking in vain for the help that did not come, and there might have had to be told over again the story of privation and death with which the history of the sea has made us only too familiar."—*Portobello Advertiser*, April 20th.

The Right Honourable Herbert Samuel, M.P., Postmaster-General, referring to the disaster at the dinner of the London Chamber of Commerce on April 18th, said:

"Those who had been saved had been saved through one man, Mr. Marconi, whose wonderful invention was proving not only of infinite social and commercial value, but of the highest humanitarian value as well. He had seen it stated that in the United States of America the efficiency of the wireless telegraphy service had been impaired by lack of regulation. He did not know whether that was well founded or not, but as Postmaster-General he could assure them that such disturbance was impossible here. Parliament had given the Postmaster-General a complete control over the use of wireless telegraphy, and no one could operate or establish a station without the Postmaster-General's licence, which was only very sparingly given, and for purposes of experiment and research and under such conditions which precluded disturbance of commercial or humanitarian messages. Round the coast, in charge of his department, there was a girdle of wireless stations which were in constant communication with the telegraphic services of the country and with the life-saving stations. No fewer than 400 liners had been equipped with wireless apparatus, including a certain number of cargo vessels. All the operators on these ships were required to hold a Post Office certificate of efficiency, and to answer immediately any signals of distress, and under conditions which, as far as possible, precluded interference with one another."

The inevitable crop of problems have arisen out of the disaster to the "Titanic," several having to do with wireless telegraphy. A number of false rumours were spread about the wreck, and these were attributed to the operations of amateur wireless telegraphists on

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the Atlantic coast. Whether the origin of the false statements is traceable to this source or not, it is satisfactory to note that the American Government have quickly taken steps to bring the practice of wireless telegraphy on their shores under control.

It is as well to emphasise the fact that in this country an amateur who is interested in wireless work is not allowed to put up an installation unless he can show that he intends to undertake serious research work. Even then it is necessary for him to explain to the authorities the exact dimensions of his proposed plant, and to submit to such conditions as ensure that he cannot interfere with the serious work carried on in connection with the system. An additional safeguard is provided in the fact that the sanction of the Marconi Company is necessary before Marconi instruments can be employed. In the United States amateurs are still allowed to carry out experiments as they wish, but, as has already been indicated, legislation on the subject is expected shortly. Quite apart from restrictive legislation, the progress of wireless telegraphy has added to the difficulties of interference. Even in the old days of the coherer it was possible by means of having two coherers on the one antenna to receive two messages simultaneously. With the recent advances made in tuning, it may fairly be claimed that interference has become a trouble of the past. Inquiry shows that all the messages which came through the Marconi Stations were accurate.

In view of the outcry that every ship should carry more than one wireless operator, it should be mentioned that many large ships have already two operators, but in the case of the smaller vessels questions of economy have to be considered; but a more serious matter than that is the thought that there may have been several vessels in the vicinity of the "Titanic" which were not fitted with wireless telegraphy, and therefore were unable to respond to the liner's insistent appeals for help. It is a remarkable fact that outside the Navy the number of ships flying the British flag which are fitted with wireless reach about 400, whereas Lloyd's Register contains the names of something like 30,000. It would seem just as necessary for a tramp steamer to carry wireless as for a liner, so as to ensure this safeguard for its crew, and to be able to answer the distress calls of other vessels. Hitherto, the tendency of legislation passed abroad has been to insist upon the installation of wireless telegraphy only on ships carrying passengers; but the time has probably come when the public realise the value of an extension of the system to all ocean-going vessels.

The news of the loss of Mr. J. G. Phillips, who was the chief operator on board the ill-fated "Titanic," occasioned a most profound

*J. G. Phillips, Chief Marconi Operator on Board the "Titanic."*

sorrow among his colleagues. The columns of the daily Press have, during the past few days, echoed the noble heroism which he displayed, and have presented us with vivid glimpses of his splendid self-sacrifice that make us glow with pride for the bravery of our deceased colleague. We cannot do less than add our testimony to his disinterested self-sacrifice and cool demeanour in time of danger, and those of us who had the honour of personal acquaintance with him knew that such conduct was characteristic of him.

Mr. Phillips was a native of Godalming, and was educated at the local grammar school. He started his career as a telegraph learner in the Godalming post office, and in March, 1906, he joined the Marconi school at Liverpool. In August of that year he was appointed to the operating staff, and sailed on various ships—notably the "Teutonic," "Pretorian," "Buccaneer" and "Oceanic." He also served on the operating staff of the high-power Trans-atlantic wireless station at Clifden from May, 1908, to July, 1911. His loss will be mourned by a large circle of friends among the company's staff, while his example is one of the noble instances of devotion to duty which brighten the annals of wireless telegraphy.

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Mr. H. S. Bride, who served as second operator on the vessel, and who was among the saved, was born at Nunhead, and educated at Roan School, Greenwich, and the Technical

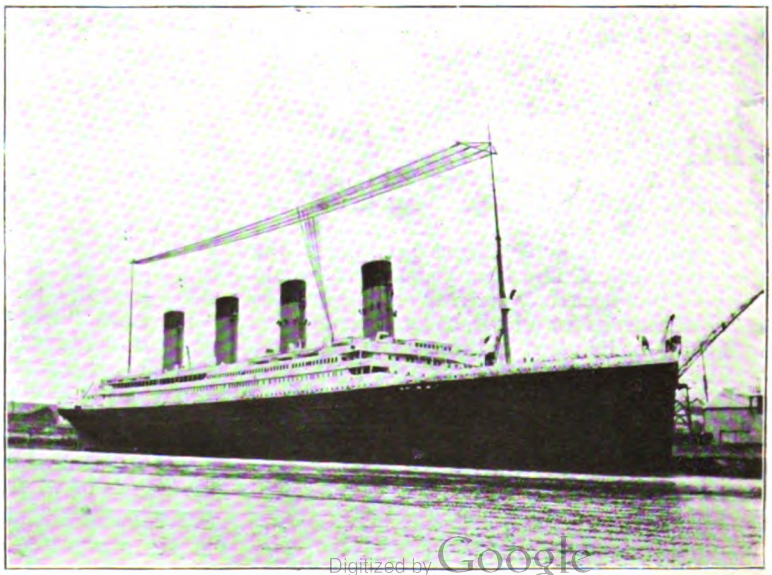
*H. S. Bride, Second Operator on Board the "Titanic" (rescued).*

School, Beckenham. He entered the wireless service in July, 1911, and has served at different times as operator on the "Haverford," "Lusitania" and "Anselm."

## Wireless Equipment of the "Titanic"

THE wireless equipment of the "Titanic" was the most powerful possessed by any vessel of the mercantile marine, and only equalled by that of the "Olympic." Its generating plant consisted of a 5-kw. motor-generator set, yielding current at 300 volts 60 cycles. The motor of the set was fed at 110 volts D.-C. from the ship's lighting circuit, normally supplied from steam-driven sets; while, in addition, an independent oil-engine set was installed on the top deck, and a battery of accumulators was also provided as a stand-by. The alternator of the motor-generator set was connected to the primary of an air-core transformer, and the condenser consisted of oil-immersed glass plates. To eliminate as far as possible the spark-gap and its consequent resistance, which, as is well known, is the principal cause of the damping of the waves in the transmitting circuit, the ordinary Marconi rotary disc discharger was used. This is driven off the shaft of the motor-generator. The guaranteed working range of the equipment was 250 miles under any atmospheric conditions, but actually communication could be kept up to about 400 miles, while at night the range was often increased up to about 2,000 miles. The aerial was supported by two masts, 200 ft. high, stepped 600 ft. apart, and had a mean height of 170 ft. It was of the twin T type, and was used for the double purpose of transmitting and receiving. The earth connection was made by insulated cable to convenient points on the hull of the vessel.

The receiver was the Marconi standard magnetic travelling band detector used in conjunction with their multiple tuner, providing for the reception of all waves between 100 and 2,500 metres. The multiple tuner was calibrated to permit of the instrument being set to any prearranged wave-length, and further to be provided with a change switch to permit of instantaneous change of the circuit from a highly-syntonised tuned condition to an untuned condition (for stand-by) especially devised for picking up incoming signals of widely different wave-lengths. By reason of its robust nature the magnetic detector could be employed permanently connected to the transmitting aerial, thus dispensing with all mechanical change over switching arrangements.



*The ss. "Titanic" leaving Southampton.*

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## Wireless Telegraphy on the British Gold Coast

ACCRA, a fort on the Gulf of Guinea, about 80 miles east of Cape Coast, is one of the latest centres whereon Marconi's Wireless Telegraph Co., Ltd., have contracted to supply and erect a radiotelegraph station. It has been since 1876 the capital of the British Gold Coast Colony, and with its population of 20,000 inhabitants is an important town, being, in fact, the first in the Gold Coast Colony to be raised to the rank of a municipality. The sea frontage extends about three miles, but there is no harbour, and steamers have to lie about a mile out; goods and passengers being landed in surf boats.

The radiotelegraph station will be equipped with a 5-kw. set, driven by an oil engine. As the plant is required for working in a damp, tropical climate, special attention will have to be given to the materials used in construction of the apparatus; hence wood will be used as sparingly as possible. The station will be capable normally of a sending wave 300 metres in length, but it will be also capable of transmitting waves varying in length from 600 to 900 metres. Five masts in all will be provided, the main mast being of the sectional steel type, 200 feet in height; the remaining four masts will each be 60 feet in height, and will be of the tubular steel type arranged symmetrically on the circumference of a circle having the main mast for its centre. The main aerial will be of the umbrella type, and the second will be a twin wire type aerial.

There will be no special features in connection with the power plant. The prime mover will be a 5-h.p. oil engine, and to this will be direct-coupled a 3-kw. continuous current dynamo, having a pressure regulation suitable for enabling it to be used to charge the accumulator battery of 54 cells. The motor alternator will consist of a continuous current motor, designed to run off the accumulator battery and to drive a disc discharger mounted on an extension of its shaft. The transformer will be designed to afford a transformation ratio of either 300 to 10,000 or 300 to 5,000 as desired.

There will also be provided a transmitting jigger and aerial tuning inductance, whilst the manipulating gear will consist of a Morse hand-key actuating an electromagnetic relay key in the transformer primary circuit. The receiver will be of the standard telephone magnetic detector pattern, working in conjunction with the multiple tuner, the combination being capable of syntonising the receiving circuits to all wave lengths between 100 and 2,300 metres.

The Accra station will be employed mainly for communication with ships, and its erection will be watched with interest, inasmuch as it will afford further proof of the ease with which wireless telegraphy may be worked in tropical climates.

## The Imperial Wireless Scheme

AN echo of the Imperial scheme of wireless telegraphy, which we described in our April issue, was heard in the House of Commons on April 3rd. On the motion for the adjournment of the House for the Easter recess several members raised the question of Imperial inter-communication. Mr. Herbert Samuel, the Postmaster-General, replied with respect to the specific question raised during the discussion—the question of cable rates, with special reference to the advisability of the construction of a state-owned Atlantic cable. In the course of his speech he said:

> "With a view to improving the strategic communications of the Empire, and also to enable Press rates to be reduced, I have entered into arrangements, as the House is aware, with the Marconi Company for the erection of a chain of wireless stations to connect this country with India, Australia, and New Zealand, at a total cost of over half a million pounds, which, we believe, will be of importance from a naval and military point of view, but which will also, we anticipate, enable the rates to be reduced for wireless telegrams, and at the same time not be unremunerative to the Governments which are partners in this enterprise. It is a plan which will place the British Empire far in advance of any country in the world respecting wireless telegraphy."

Mr. L. Harcourt, the Colonial Secretary, who also took part in the debate, said with regard to wireless telegraphy:

> "It is a remarkable advance in the eight or nine months since the [Imperial] Conference closed to be able to say that we are now covering three-quarters of the world by an Imperial system of wireless telegraphy. We have a service from London to Egypt, from Egypt to Aden, from Aden to Bombay, from Bombay to Singapore. Northward, in the future, to Hong-Kong, and southward, in the almost immediate future, to Australia. . . . We intend to have wireless communication from Aden to some point in the Union of South Africa, possibly Pretoria; and if the resources of science will not allow that to be done, we may decide to make an intermediate at Nairobi."

Rapid progress is being made with the military wireless installation at Fort William, Calcutta, and the finishing touches are now being put to the last six masts.

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# Wireless in the Southern Pacific

## The Stations in the Fiji Islands

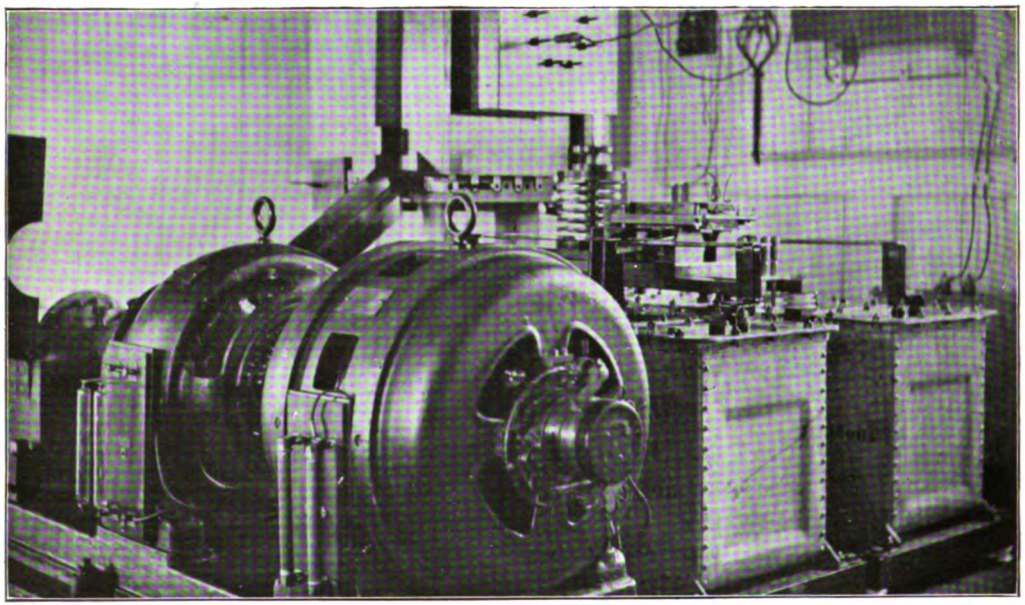
UP to the time of the opening of the Suva station there were no commercial wireless telegraph stations south of the Equator. Fiji is therefore satisfying a decided want in providing a first-class service for ships equipped with wireless apparatus. The last of the stations erected by the Marconi Co. was satisfactorily completed and turned over to the Government early last October. The control station, situated at Vatawaqa Point, near Suva, the capital, communicates with the other two island stations, and also handles all ship traffic. To facilitate the dispatch of messages it is connected to the town and to the office of the Pacific Cable Board by line telegraph and telephone. Delivery at the other stations is effected by native runners.

Suva is fitted with a self-contained 5-kw. disc set, capable of transmitting all waves between 600 and 1,200 metres. A valve tuner is provided in addition to the ordinary magnetic receiving set. Uniform radiation is effected from an umbrella aerial suspended from a 160-ft. sectional steel main mast to four 50-ft. extension poles.

Lambasa, the centre of a large sugar cane estate, is similarly equipped. The third, a self-contained 1½-kw. set, is at Waiyevo, the Government station on the Island of Taveuni. Marconi boats lying at Hobart, Tasmania, report signals from Suva as good and clear. Similar reports came to hand from Honolulu, Sydney, Wellington, and Auckland.

The stations are owned and operated by the Government in accordance with the regulations of the International Radio-Telegraphic Convention. Ship messages are charged at the rate of tenpence a word, cable counting, without a minimum. All ships communicating with the stations must conform to this rate, which is divided between the two stations in the usual way. The normal range is 300 miles, but every effort is made to handle messages over greater distances when occasion arises. The service is open from 10 a.m. to 4 p.m., and from 8 p.m. to 2 a.m. Arrangements are pending for a continuous watch to be kept.

An inter-island service is also open to the public at the rate of threepence per word, count-



*Transmitting Apparatus at Suva—5-K.W. Disc Set.*

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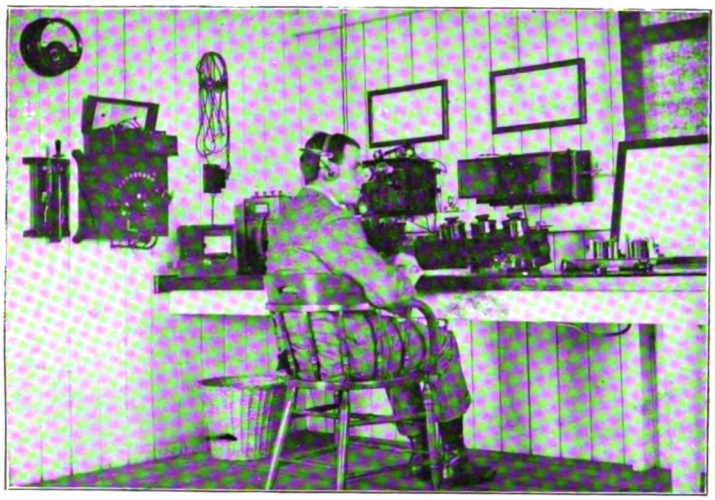
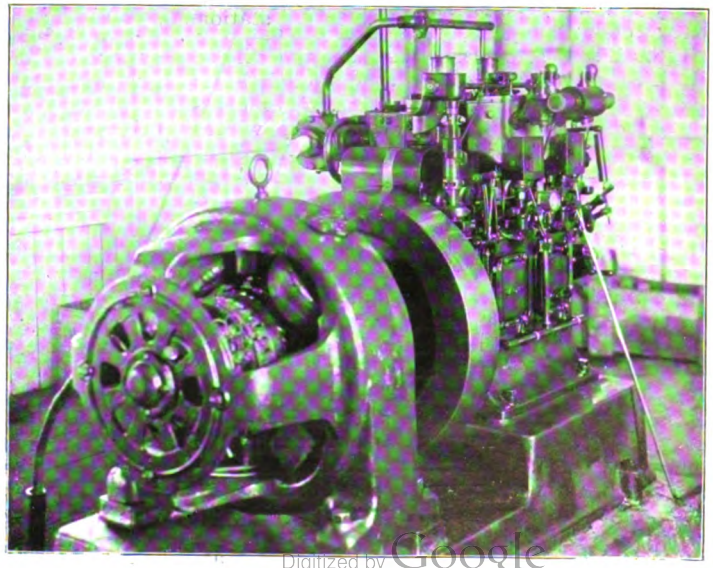


*Interior of Station at Suva.*

ing as above. This includes free delivery in the town of Suva, and within a mile radius in the case of the other two stations. Suva messages are collected and delivered by the Pacific Cable Board, their office being connected to the wireless station by line telegraph. Messages are collected at the wireless stations at Lambasa and Taveuni. Delivery beyond the mile limit from these stations is charged at the rate of one shilling per message. The Lambasa and Taveuni stations are open from 10 a.m. to 4 p.m. each weekday, and to clear at 8 p.m. Sunday hours are from 10 to 10.30 a.m. and 3.30 to 4 p.m. The system is working satisfactorily in every way, and should be of great value to all concerned. The service "via Marconi" compares more than favourably with the cable communication between Suva and Levuka.

We may now leave the technical and commercial aspects of this subject to record some impressions gathered during a sojourn in the district. The journey to Fiji was one of varying scenes and temperature. Leaving England on a typical December day, the last of John Bull's Island was enveloped in a cold, damp mist, through which the rugged coast of Cornwall loomed treacherous and forbidding. The trans-Canadian journey was through a white country, and the temperature was extremely low at places, especially at Winnipeg, where the thermometer stood at 15° below zero. After crossing the "Great Divide," and commencing the descent of the Pacific Slope along the precipitous banks of the Frazer, the whole aspect of the country was changed.

The journey to Fiji from Vancouver occupied about eighteen days, the steamer calling at Victoria, B.C., Honolulu, and Fanning Island. Honolulu well deserves its name as the Paradise of the Pacific, and raises hopes as to what may be found in Fiji, which hopes are not to be disappointed. The Fiji Isles are a sub-tropical group of some couple of hundred islands of all sizes and varieties. They are mostly of volcanic origin, and surrounded by coral reefs. The vegetation is rank and exuberant in places, while in others grass-covered mountains predominate. Some of the river scenes are of unsurpassable beauty; the vivid greens of the tropical shrubs and creepers bathed in golden sunlight make a succession of ever-changing scenes, both restful and pleasing to the eye. Cocoanut, banana, and sugar cane planting are the staple industries of the colony, but tea, tobacco and hemp



*Engine Generator Set at Suva.*

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are also cultivated. An excellent steamship service provides a good means of getting these products to the Australian and New Zealand markets.

The Fijians have evolved, in the course of a generation, from a barbaric race to a peaceful, happy people, living comfortably on the rents of their lands. A Fijian is no lover of work, and it was with difficulty that the requisite number of "boys" could be got together to help in the erection of the stations. They had to be tempted to toil by offers of extra food, money being a matter of comparative indifference to them. In his native village the Fijian is clean and orderly, though he is inclined to be lazy. A "disease," unfortunately only too prevalent among the whites as well as the natives, is malua fever (bye-and-bye fever)—the practice of never doing to-day what can be put off till to-morrow. A frequent answer when a boy is told to do anything is "Malua"! The natives are usually hospitable and courteous to visitors who penetrate into their villages, and one is generally asked to partake of some kava—an infusion of the root of a shrub, and a popular drink throughout the South Seas. It is excellent to quench one's thirst, and taken in moderation is of value medicinally. An overdose, however, results in temporary incapability of one's lower limbs. In taste it resembles soapsuds with a dash of pepper. The ceremonials attendant with kava drinking are varied and extremely artistic.

A large coloured element in Fiji are the immigrant Indians from Southern India. These people are brought from India each year and indentured to planters in the Islands. At the expiration of their term of service they are at liberty to return to India, or remain on in the islands. In very few cases do they return to India, and as a consequence the population is being rapidly increased. The Indians already greatly exceed in numbers both whites and Fijians combined. They are a very different people from the happy, smiling Polenesians. Mercenary and crafty, with an habitually sullen expression, they regard one's every action with mistrust, and suspect everyone of continually trying to "do" them. In a word, they judge others by themselves. Still they fill a gap, as, unlike the Fijian, they will sell their very souls for "pica."

*View of Suva looking across the Harbour.*

Life on the stations possesses many fascinations, and it is delightfully free from conventionalities. The white population are extremely hospitable, and new comers to the Islands are welcomed with open arms. The erection was carried on in great comfort, as it was possible to live on the site in the station quarters, and also to keep the labour close at hand.

In the evening, when the "knock-off" bell had gone, the boys all cleared off for a tub, and then sat down to their "ki-ki" (food). This consisted of rice and canned meat. Having consumed a prodigious quantity, they idle around their fire or decorate themselves with

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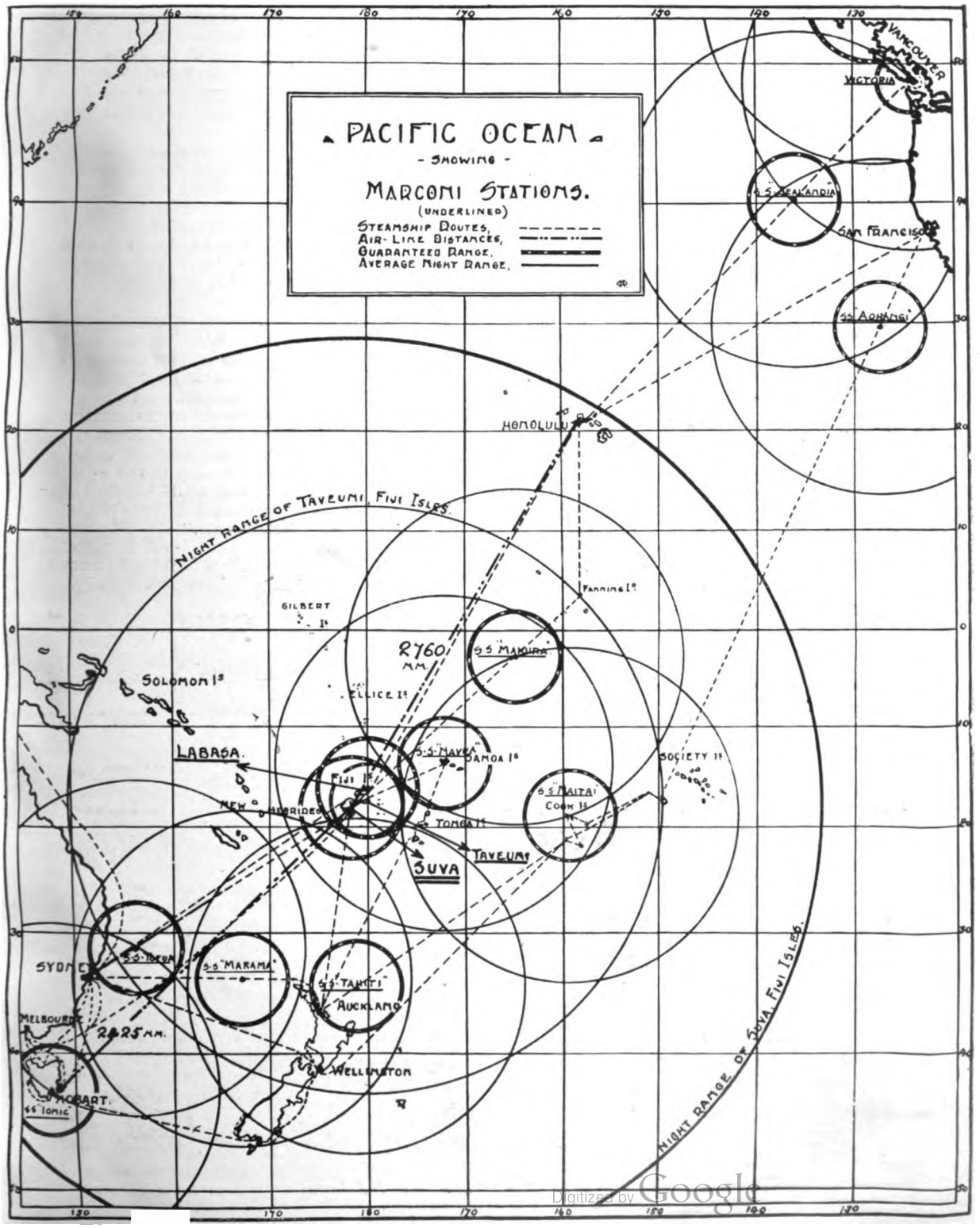


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banana leaves and creepers, and commence singing one of their weird native "mekes"—a crude melody accompanied by a rhythmic motion of the hands, heads and legs. The volume and quality of their voices comes as a surprise to the stranger, and their mode of singing is extremely novel. A leader keeps time by beating on a log with two sticks. A very popular song among the Fijians is "I never shall forget you." They always favoured us with this when they were specially pleased with the day's work, or when we presented them with tobacco or kava.

The Fijians behave like overgrown children, and if anything untoward happens they go off into peals of shrill laughter. This is particularly annoying, especially if a couple of hundred feet of aerial wire gets kinked into a hopeless muddle, and while one stands in the fiery heat of a midday sun trying to unravel it, a group of Fijians are standing around as if it had been done for their entertainment.

An incident at Lambasa brought out the irresponsibility of the native in a striking and almost tragic manner. Two men were being lowered in a bo'sun's chair from the working cage by a couple of boys. Without warning one of the boys walked away, and the extra strain pulled the winch handle out of the other's grasp. Had not a nigger, employed in the mast erection, instantly run up and caught the flying handle on his chest—a plucky and risky thing to do—a nasty accident might have resulted. The native interest when the condensers splashed at Suva, and during the rock blasting at Lambasa, was exceedingly amusing A volley of rifle shots could scarcely have shifted them quicker.

The Southern Pacific is an evergreen memory to all who have been fortunate enough to spend any time there. Reflecting on a sojourn there after returning to London, one fully realises the truth of the remark:—

"The price of the journey is not altogether covered by steamship fares and the hotel bills. To these the voyager must be prepared to add the red-gold coin of a little heartache, the heavy silver of a little longing, paid down on the counter of life for long months after the journey is a memory of the past. There is no quarter of the wide earth's surface that holds the heart so strongly, no beauty of the world's many tropical lovelinesses that haunts, and returns, and calls like the realm and the beauties of the sunny South Sea Islands."

*The Marconi Construction Party. The Engineer in charge was Mr. J. J. Leary, who is shown seated in centre of the group, accompanied by Mr. R. H. Strichland (right) and Mr. C. H. Keith (left).*

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# Bunting's Goddess.

## A Tale of a Wireless Station.

WE were all agreed that Bunting should never have joined the "wireless" service. He had taken the step in the innocence of a heart fired with stories of wireless appeals for help at sea, and of the trans-ocean pursuit of criminals. These he regarded as daily events in the lives of operators; and he felt aggrieved when he found that he was merely a link in a chain of communication for the benefit of business men and other soulless people who were inclined to use codes. Garston, who was a sarcastic recruit from the cable service, declared that Bunting was attracted to wireless telegraphy because he thought that the "x's" which disturbed the peace of the operator were genuine kisses, and not atmospheric electrical freaks. Bunting replied that he had never in his life hugged such a delusion; and Garston admitted that Bunting was not likely to embrace anything so unsubstantial.

However, we were very pleased to have Bunting with us at what I may call "X" Station. Like most wireless stations, it stood on a bleak headland, with one leg in the sea; and it was three miles from the last outpost of civilisation—the fully-licensed Moor Hotel. Bunting was quartered there, and when he came on duty he supplied us with much-needed comic relief. His three-mile walk (the "road" between the hotel and the station was beyond any vehicle except an aeroplane) put him in a bad temper, which he vented in words that banged and rattled like our high-power transmitter. In the intervals of work he would sing ballads in a falsetto tenor; and he never let a day pass without telling us one or more of his adventures with a young lady who alternated between the stage of the "Frivolity" and an apartment house in Tulse Hill.

### The Operator's Romance.

One morning he arrived looking as I imagine Mr. Martin Harvey would look if he were representing Sydney Carton after a fearful night. He glared at us and flung himself into a chair.

"Just my infernal luck!" he groaned.

Garston went up to him and patted him on the head.

"Poor boy!" he said. "Has Yvonne fled from Tulse Hill with the stage manager? Fortify yourself with the thought that you are the last—that is to say, the latest—man to be deceived by woman. Centuries ago a French king scratched the following couplet on his prison window:

*"Souvent femme varie,*
*Bien fol est qui s'y fie."*

Bunting jumped to his feet.

"Bosh!" he cried. "I had not even the chance to be deceived by her."

"After all these adventures?" began Garston incredulously.

Bunting waved his hand, as if dismissing Yvonne summarily by the O.P. side.

"I met her last night," he said solemnly.

"A woman!" I murmured. "Last night?"

"Another dream," commented Garston mournfully.

"She was incredibly real," exclaimed Bunting, "incredibly real and incredibly beautiful! Figure to yourself"—Bunting had been to Boulogne several times and considered he had a right to appropriate a French phrase if he wanted—"my feelings when I got back to the hotel last evening, at sunset, and came round the north-west corner and saw, sitting on the bench where I have kicked my profane heels for hours, the most radiant vision of a female that I have ever seen here, or in Paris, or——"

"Or in Tulse Hill," interjected Garston.

"The sunset light was full upon her," continued Bunting, "illuminating a face and figure that would have killed Venus and Diana with envy. I say no more. I gazed, I stood, I was conquered. In a flash I recollected that she and I were alone in the desert, as it were. Introductions would, of course, be superfluous. I put on my 'C.Q.D.' smile and advanced——"

"Yes?" said Garston. "You advanced, you grinning idiot, and she retreated—fled—bolted, no doubt, to the bar-parlour as the most convenient refuge."

"Wrong again! She had the sun in her eyes, and did not see me. But at the moment of my determined advance another man also advanced round the south-west corner. I foresaw a collision—perhaps blood. *She* solved the difficulty by turning to him and saying, in the sweetest and most natural voice imaginable, 'What a long time you have kept me waiting, George.' Then she took his arm and strolled off with him, not so much as glancing at me—me, with black murder in my heart."

"George?" muttered Garston. "What a name!"

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" I suppose it was Yvonne ? " I asked.

Bunting replied in language which startled me, even though I have been the bosom friend of many a Scotch engineer on board big liners. Maurice Hewlett would have been glad to pick up some of his rich, old, highly-embroidered words. I gathered that Yvonne was related to this monopolised beauty as a worm is to a divinity.

" Well, there is nothing for it," said Garston coldly. " We must kill the man."

" Too obvious," commented Bunting. " Besides, it is an axiom in affairs of this kind that the death of a lover does not divert the affections of a woman towards the murdered."

" You are an expert," admitted Garston, " so I suppose you are right."

" Who is she, anyway ? " I asked.

" I don't know," replied Bunting. " A woman's name is the last thing I think about."

Garston told him he was an unscrupulous rascal. Bunting was too depressed to explain—as he usually did with desperate solemnity on such occasions—that he did not mean what he had appeared to mean. He went on duty with the air of a Suffragette entering Holloway.

### Materialisation of the Goddess

Next day he brought us the refreshing information that her name was Rosa. Incidentally he had learned that the man's name was Johnson. Bunting was not the kind of man to call a vision of loveliness Mrs. Johnson upon any consideration whatever. It was as Rosa that she entered the endless procession of Bunting's goddesses. It was about Rosa, Rosa, that we heard day by day. Beginning by being perfect, she proceeded to be super-perfect, in spite of the gloomy proximity of a husband. There was one radiant day when she had actually said " Good morning " to him at the entrance to the hotel. There was another glorious occasion when he had been privileged to stand aside and let her walk past him in a corridor. For these thrilling moments he had paid in full by submitting to a few conversations with the too faithful husband—a young man who could be induced to talk about nothing but the weather and the fishing.

Garston and I paid a few visits to the hotel in the hope of being allowed to gaze upon this divinity. But on each occasion she had disappeared with her satellite into some recess of the landscape. We were extraordinarily disappointed, for even Garston had become infected with Bunting's fever of worship. He concealed his symptoms under Iago-like remarks which drove the perfect lover to a frenzy. Nevertheless, it was he who arranged the official letter offering to extend the courtesies of the station to Mr. and Mrs. Johnson.

They accepted. And if Bunting's heart had not been very strong the news would have put a sudden end to his interest in love and everything else. He survived, because he looked forward to a possible extinction of the husband. The man might take a fancy to sit down upon the alternator, or lean against the whirling belt—anything simple and effective might occur in a wireless station. Apart from that, it was he—Bunting himself—who was to have the honour of explaining everything to HER. He was to tell her the whole story up to the magnetic detector and the bridging of the Atlantic.

We had a dreadful time with him until the day of their arrival. Garston had to administer doses of bromide to keep him at his post. Two hours before the visitors were due to arrive Bunting went to the look-out with a telescope. When he had at last sighted them he rushed around the station like a whirlwind to see that every nut and every bolt was in readiness to do homage.

### The Station Welcome

Then a surprising thing happened. As soon as they crossed the threshold Bunting became cool and collected, as if he were a past-master of ceremonies. He make a formal little speech of welcome, and introduced Garston and myself with felicitous and flattering remarks. Then he led them slowly round the station, explaining everything with the conviction and simplicity of an expert. Thus I had ample leisure to study the goddess. She was pretty, certainly, and had a wilful, commanding air which was attractive enough. Her husband was a quiet, determined individual. They were dressed in what I believe to be the prevailing fashion in good society.

Everything went ahead on orthodox lines until Mrs. Johnson asked a question.

" I suppose," she remarked, " that you get many curious messages through at times ? "

Bunting smiled, as a Foreign Secretary might smile if a lady suggested that he knew one or two State secrets.

" Frequently ; oh yes, quite frequently," he replied. " If I were not under the oath of secrecy I would entertain you for hours with examples. A recent one I may, however, mention to you, as it is practically public property. Some rich, old gentleman has been spending hundreds of pounds in frantic messages to all the liners, and in replies to their replies. ' Have you on board,' he asked, ' a lady in a long coney-seal coat, and hat with white wings, who has decamped with an unscrupulous adventurer dressed in a green lounge suit with green Homburg hat ? ' He offered to pay all the expenses of the answers, and so——. But, of course, you will have seen all about it in the papers ? "

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"We read no papers," broke in the husband.

"Oh, ah! Well, we have been kept busy with the answers, I can tell you. It appears that the old man returned from a Continental visit to find that the penniless blackguard had got ten days' start with his daughter, who has pots of money in her own right. The foolish girl and the fortune-hunting scamp were traced to Liverpool; there was a rumour also that they had slipped down separately to Southampton. Anyway, they got to sea somewhere and somehow, and it remained for the Hertzian waves to search them out. Our service has, in fact, proved so successful that they have been discovered on six or seven boats—which is impossible, as Euclid used to say. There was a nasty scene at Lisbon, where the detectives dropped on a mining engineer and an English governess, who had nothing to do with the case. At present, according to the conviction of several sea captains, the villain and his dupe have divided themselves into five separate entities, and placed themselves on five different vessels."

**Station Hospitality**

Bunting rattled ahead about the scandalous elopement until Garston drew our visitors gently away for a cup of tea—the limit of station hospitality. During tea, Bunting switched off to the stories of heroism at sea. There was one, I remember, about an operator whose ship had been sunk in six fathoms of water. He had continued to send the C.Q.D. signal for ten hours, sustaining himself by the ozone emitted by the condensers.

After their departure Bunting sank into a chair, limp and exhausted.

"I have done my best," he gasped.

"The Admirable Crichton could not have done better," commented Garston, "but some of your yarns were as tall as our aerials."

"They appealed, though; they appealed," Bunting claimed feverishly.

"They seemed bored about the runaway couple," I remarked. "I expect they only pretended not to know about it."

"They are in love," sighed Bunting. "They are deaf to the thunders of the ether."

"Bosh," said Garston. "They were probably runaways themselves."

As he spoke the words his expression changed. He made a sudden dive towards a higgledy-piggledy pile of newspapers and magazines on the table, and began turning them over in a frenzy of haste. A second search gave him the one he wanted. He opened it and thrust the page against Bunting's nose.

"If you have got any eyes to see," he shouted, "look!"

Bunting looked. I looked. And there fell upon us a cold and awful silence, broken at last by Garston in his most acid tones:

"There's a reward of £500 to the man who gives the first information."

Bunting sprang to his feet and then sank back again.

"Gentlemen . . . " he began feebly.

"That's all you need to say," remarked Garston.

. . . . . .

Bunting told us the rest of the story with tears in his eyes. He had taken the first opportunity of an interview with them.

"I think it only courteous to inform you," he had said, "that your identity is known to us."

They had looked at each other with a smile.

Then the goddess had exclaimed: "Oh, Mr. Bunting!"

That was all! That was really all. They had not asked Bunting whether he had earned the £500.

They went quietly back the very next day to make peace with the enraged father. Evidently the goddess managed it with her characteristic skill, for we read in the newspapers of a confirmatory wedding celebrated with a huge amount of pomp.

We abolished our savings in sending the bride and bridegroom a present. And a little later there came a gold chronometer and chain for Bunting and a trifle for Garston and myself, "in acknowledgment of the courtesies of the station."

---

Major S. Flood Page, one of the directors of Marconi's Wireless Telegraph Co., Ltd. speaking at a meeting of the London Chamber of Commerce on April 18th (at which he was elected a member of the Council), said that all those who were connected with wireless telegraphy were dissatisfied with what had taken place in America during the 'Titanic' disaster. Such a thing could not happen in England. The United States was the only country in the world where the telegraph system did not belong to the Government. There was apparently little control over any telegraphic communication, and, unfortunately, it had become the fashion in the United States to have what was called "amateur wireless." That was impossible in England, because no man could practise wireless telegraphy, even for experiments, without a licence from the Post Office. This should be borne in mind when they read about the feeling of terror caused by the fear lest Marconi wireless messages might be tapped. The present experience had produced one satisfactory result, as President Taft had announced that he would bring a Bill before Congress so that such occurrences should not take place again.

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THE MARCONIGRAPH

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The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

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SITUATION VACANT.

**ASSISTANT WIRELESS INSTRUCTOR Required.** Must be good Operator and have thorough knowledge of the Marconi System. Commencing Salary £120 per annum. Apply to the British School of Telegraphy, 179 Clapham Road, London, S.W.

### The Share Market

The market in the various Marconi shares continues one of the most active features of the Stock Exchange. The ordinary shares which were quoted in our last issue at $5\frac{1}{2}-\frac{5}{8}$ have risen in the past month as high as $9\frac{3}{16}$.

During the month the shares of the American Marconi Company were introduced on the London market. The capital of this company has been increased to £2,000,000 in shares of 5 dols. each. There has been very active dealing in these shares, which had previously only been dealt in in America.

The shares opened on the London market at $3\frac{1}{4}$, and were quickly bid up to $3\frac{7}{8}$, but after the price fell away on profit taking from America, the shareholders in the old company having a right to subscribe for the new issue on such advantageous terms, they sold largely on the opening of the market here.

The present prices of the various issues are :

| | |
|---|---|
| Ordinary ... ... ... | $8\frac{3}{16}-\frac{1}{4}$ |
| Preference ... ... ... | $7\frac{7}{16}-\frac{9}{16}$ |
| New Shares ... ... ... | $5\frac{15}{16}-6\frac{1}{16}$ |
| Canadian ... ... ... | 32/9–33/3 |
| Spanish ... ... ... | $2\frac{1}{16}-\frac{1}{8}$ |
| American ... ... ... | $2\frac{9}{16}-\frac{11}{16}$ |

### The American Marconi Co.

The following is an extract from the directors' report of the American Marconi Company for the year ended January 31st, 1912 :

"The balance-sheet shows that during the past year fairly satisfactory business has been done and advances made in the progress of the Company. In accordance with the conservative custom heretofore prevailing, our auditors (Messrs. Deloitte, Plender, Griffiths & Co.), have deducted for depreciation on all station and experimental work the usual 10 per cent., and it is pleasing to note that after such deduction a working balance remains, also that after writing off the loss standing to the debit of profit and loss account, a small amount stands to the credit of this account. During the latter part of the year 1911 your Company extended its activities to the Pacific Coast, and while operations have been established there since the latter part of November only, fourteen vessels, both passenger and freight, have been equipped; stations have been erected at San Francisco and San Diego, and although there has not been much time in which to try out matters fully, receipts shown to date are eminently satisfactory. It is the intention of your company to erect other stations on the Pacific Coast, at most prominent points, so that the service on

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the Pacific Coast will rank in order with the very efficient and continuous service now provided by this company on the Atlantic Coast. Following the very favourable decision in the patent action which was obtained in England by Marconi's Wireless Telegraph Company, Ltd., of London, your company has commenced actions against various users of wireless apparatus, which it claims infringe the Marconi basic patents, notably against the United Wireless Telegraph Company and the Clyde Steamship Company, the New England Navigation Company—using apparatus supplied by the Massie Wireless Telegraph Company—and the National Electric Signaling Company—which operates under the Fessenden System. Evidence has been submitted in some of the cases; an early trial before one of the judges of the United States District Court will be had, and, without prejudging the case, we think we may confidently look for a decision in our favour similar to that obtained in England. Matters of great importance, both regarding the welfare of this company and also of the entire Marconi System, are now pending; these matters cannot be discussed in full as yet, but it is hoped that developments will have so far progressed as to enable a full statement to be made at the annual meeting."

Since the above report was issued the actions against the United Wireless Telegraph Company and the Clyde Steamship Company have been settled completely in the favour of the Marconi Company, both the defendants having acknowledged the validity and scope of the Marconi patent, admitted their infringement, and submitted to permanent injunction in favour of the Marconi Company.

### The Belgian Company's Report

The annual general meeting of the shareholders of the Companie de Télégraphie sans Fil (the Belgian Marconi Company) was held at Brussels on May 1st. The directors' report showed that during the year under review the number of maritime installations controlled by the company was seventy-four. Twenty-eight new installations were carried out during the year ending December 31st, 1911, but, on the other hand, installations on board forty-two vessels were ceded to associated companies. During the same year the Companie de Télégraphie sans Fil participated in the construction of the Deutsche Betriebsgesellschaft für drahtlose Telegraphie, to which concern it transferred the stations operated on board German commercial vessels. The balance sheet shows the company to be in a very prosperous condition.

## Lack of Coastal Stations in Chili

A correspondent of the *Times* remarks that the Pacific Steam Navigation Company's coasting steamers running through between Chili and Peru have now been all fitted with the Marconi wireless apparatus, which should be a great boon to passengers by these fine and favourite steamers. It is stated that, following this good example, many of the principal teamers of the South American Company (as Chilian company running on the coast) are also to be similarly fitted. Unfortunately the absence of Marconi stations on the coast detracts sadly from the benefits accruing from this important innovation, for apart from the Chilian Government station now being erected for military purposes at Arica and the Peruvian Government station in Lima, the entire coast from Valparaiso to Panama has no means of availing itself of the advantages of wireless telegraphy.

The correspondent omits to mention that the Marconi Company are erecting stations at Punta Arenas and Talcahuano. The installations are designed to afford regular communication at all times during the day or night between these towns, taking into account the existence of severe atmospheres in that region at certain times, and also the presence of very high mountainous country between the two stations. The transmitting plant is arranged to tune normally to a wavelength of 16,000 ft. for communication over the *maximum* distance, but provision is also made for transmission on a wave-length of 8,000 ft. when desired for other communication.

## A Wireless Compass

Mr. Bellini has joined the engineering staff of Marconi's Wireless Telegraph Company, which has been engaged in developing the Bellini-Tosi Directional System. An improved apparatus has been installed by the Marconi company on the s.s. "Mauretania," the results of which have been highly satisfactory. The company is now prepared to furnish ships with installations which will enable them in a fog to define their position, besides determining the direction of land or of an approaching vessel.

## The Coastguard Services

The *Globe* announces that in future officers and men of the wireless telegraph section of the Coastguard Service will only embark in the fleet for 28 days' training once in two years, instead of every year as at present. In the case of the Signal Section no more embarkations in the fleet are to take place, but officers and men will undergo from 28 to 35 days' training once every four years in the Signal School.

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# The International Convention

## Historical Retrospect

THE International Radiotelegraphic Convention will open in London on June 4th, and promises to be an event of great importance. The time is not ripe for dealing with the propositions which will be brought forward at the various meetings, but a few sidelights upon the past history of the Convention may help to a general understanding of the matters, which we hope to deal with in our next and succeeding issues. The Convention owes its existence to the practicability of Mr. Marconi's invention, and to the advance which he was able to make under the ægis of Marconi's Wireless Telegraph Co. The progress of the invention was carefully watched by the British Government from the first entry into the field of practical application. By the year 1899 the Marconi system had reached a point of development when the Admiralty thought it desirable to obtain sets of the apparatus for trial and two years later an agreement of a limited character was entered into between the Admiralty and the company for the supply of Marconi apparatus for naval use. In July, 1903, a further and more complete agreement was entered into. At that time the increasing use of wireless telegraphy for maritime purposes had raised questions of international interest, and it had become evident that on many points regarding the interchange of messages international agreement would be desirable.

A conference met at Berlin in August, 1903, on the invitation of the German Government. The outcome of that conference was that all the powers, with the exception of Great Britain and Italy, agreed to certain proposals to be considered at a subsequent conference for the international regulation of wireless telegraphy. The British delegates had been instructed to maintain an attitude of reserve owing to the position in which wireless telegraphy was at that time placed in the United Kingdom, the fact being that in the then state of the law the Government had not that control over wireless telegraphy which would have enabled them to enforce the provisions of the Convention. The Wireless Telegraphy Act, which was passed in 1904 for two years only, and which was renewed in 1906 without modification for a further period of three years, prohibits the installation or working of wireless telegraphy apparatus in the United Kingdom, or on board British ships, without a licence from the Postmaster-General. Its principal objects were, by regulating wireless telegraphy, to make it more useful for purposes of defence and general communication. The memorandum which was laid before the House of Commons in explanation of the Bill stated that the necessity of legislation depended in the first place on the importance from the naval point of view of giving the Government control over wireless stations in time of war or emergency, and, secondly, on the desirability of placing the Government in the position to enter into an agreement on the subject with other countries if it should be found expedient to do so. The second Convention, after several postponements, was summoned for the autumn of 1906. The primary objects of that Convention may be classified under the following heads:

1. The acceptance and transmission of telegrams.
2. The adoption of rules of working.
3. The provision of means of collecting charges and settling accounts between the different countries.
4. Arrangements for the publication of all information necessary for inter-communication.
5. Rules to prevent interference and confusion in working with adequate provisions for enforcement.
6. Provision that, with certain exceptions, inter-communication must not be refused on account of the differences in the systems of wireless telegraphy employed.

A brief summary of the regulations agreed to at the 1906 Convention may be given here. The contracting parties were the Argentine Republic, Austria, Belgium, Brazil, Bulgaria, Chili, Denmark, France, Germany, Great Britain, Greece, Hungary, Italy, Japan, Mexico, Monaco, the Netherlands, Norway, Persia, Portugal, Roumania, Russia, Spain, Sweden, Turkey, the United States of America, and Uruguay. The plenipotentiaries of the governments of the countries enumerated above agreed, subject to ratification of the Convention. In some cases, notably the United States of America, the Government did not ratify the Convention, and the regulations in consequence did not apply. By the application of Articles I. and II. of the Telegraphic Convention of St. Petersburg, certain general

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obligations regarding the acceptance and transmission of telegrams were imposed on all countries. The rules and working laid down coincided with those of the Telegraph Convention, and embraced the manner of calling from one station to another, of answering calls, the order and nature of the service indications, the signals to be used, the form of telegrams, etc. The principal object secured by the regulations regarding charges and accounts was that the whole charge in all cases should be collected from the sender wherever the radio-telegram might be handed in, and a system of accounting was framed which rendered this possible. Special provisions were required to meet the circumstances peculiar to radiotelegraphy to prevent interference. The range of effect, and, therefore, the range of possible disturbance, was said to be greater the more the energy used. It was therefore agreed to lay down that stations should not use a greater amount of energy than was necessary for the particular purpose in hand. Article XXVIII. of the regulations provides "that all stations are bound to exchange traffic with the minimum expenditure of energy required for obtaining effective communication." Inefficient apparatus or operators on board ships would naturally be a fruitful source of confusion. To prevent this Article VI. of the regulations laid it down that every ship and shore station must be licensed by the government to whose authority the station would be subject, and that no ship would be licensed unless the system was a syntonised system, capable of transmitting and receiving at a reasonable speed, and not using an excessive amount of power. It was further provided that every ship fitted with a wireless apparatus must also have a telegraphist licensed by the Government to whose authority the ship would be subject; and, in order to allow him to be licensed, he must have a competent knowledge of the adjustment of the apparatus, and be able to read by sound at a speed of at least twenty words a minute, and must have a knowledge of the regulations applicable to the exchange of radiotelegraphic traffic. Articles II. and III. of the regulations specify two wave-lengths of 300 and 600 metres for the service of general public correspondence. The normal wave-length on board ship was fixed at 300 metres. Wave-lengths between 600 and 1,600 metres were excluded from commercial use, and entirely reserved for Government purposes. Besides the above specified regulations, Article VIII. of the Convention requires that the working of radiotelegraph stations shall be organised as far as possible in such a manner as not to interfere with the working of other stations of the kind.

The Convention defined the wave-lengths used in commercial work, and reserved other ranges for naval, and others for trans-oceanic work. No regulations were made limiting the damping or maximum wave energy in a train which might be used. Since the last Convention the position with regard to wireless telegraphy has changed considerably. In 1906 it seemed to have been taken for granted that the Marconi Co. possessed no fundamental or basal patent rights in Great Britain in connection with wireless telegraphy by electric waves. It was assumed that anyone was free to employ antennæ for transmitting and reception and earth connections, or equivalent means at both stations with systems of spark telegraphy, or any other mode of producing electric waves. Since then the questions as to the scope and validity of the Marconi patents have been tested in the British and American Courts of Justice, and the validity of the patents has been fully maintained. Further developments of a far-reaching nature have been carried out, and the British Government have embarked upon a scheme of Imperial wireless communications, while the use of wireless telegraphy has been extended in every direction, and its beneficial services have been demonstrated on innumerable occasions.

A greater number of countries will be represented at the forthcoming Convention than at the Berlin Convention in 1906, and a great deal of interest will centre upon the proceedings.

## The Athens Station

Mr. A. B. Blinkhorn, who was engineer in charge of the construction of the big land station at Athens, has just returned from Greece. Among other works which have been carried out in Greece by Marconi's Wireless Telegraph Co., Ltd., have been the equipment of the yacht "Amphitrae" for his Majesty the King of Greece, and the H.M.S. "Averoff." The Athens station was handed over at the end of October, 1911, and the Government have expressed complete satisfaction with the land station and the ship stations, of which they have now had several months' experience. The Athens station is at present used only for naval purposes, but it may later be opened for public service, when all boats passing through the Suez Canal will be in range of it. Two submarines, which are being built in France for the Greek Navy, are to be fitted with Marconi apparatus for wireless telegraphy.

Lieutenant Athanasiadis has been appointed by Royal Decree the Director of Wireless Telegraph Service in the Hellenic Navy. Lieutenant Athanasiadis has made a special study of wireless, and spent some time in London.

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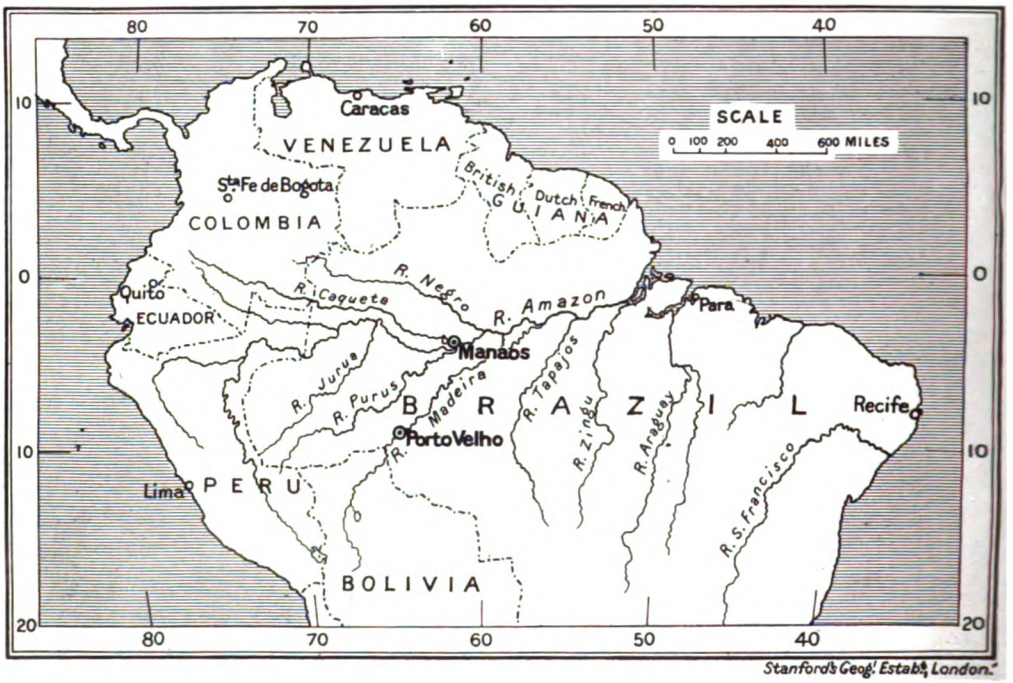
# The Wireless Mission to Equatorial Brazil

## Some Notes on the Reception of Wireless Signals




ON February 16th last a party of Marconi engineers and telegraphists left England by the Booth liner "Hildebrand" for the Upper Amazon, having as their destination the high-power Marconi station of the Madeira Mamore Railway Company. This company was formed to build a railway for effecting transportation over that portion of the Mamore river in North Brazil and the borders of Bolivia on which navigation is impossible. The actual length of the first section of the railway is 250 miles. Much might be written of the earlier attempts to construct a railway along this route, three companies having made attempts to do so, each attempt resulting in failure because of the deadly nature of the climate; but it was left to the engineers of North America to accomplish the task which proved beyond the powers of their predecessors, and when the final rail of the first section is laid next year, and the railway opens for traffic, an immense area of incredibly rich and fertile land will be opened to civilisation.

Two years ago the railway company, hampered by the impossibility of communicating quickly with its engineering staff, arranged for the installation at Porto Velho and at Manaos of high-power Marconi stations, and it is through this medium that the chiefs of the construction department have been able to maintain communication during the building of the railroad now nearing its final stage. With the advent of commercial conditions, it will be necessary to make such alterations in the Marconi stations as will enable continuous day and night services to be maintained. There is no need to refer to the stations fitted up at Manaos and Porto Velho, for these were described exactly twelve months ago in THE MARCONIGRAPH; but a brief notice might be made concerning the difficulties of communication in this district and of the means adopted to overcome them.

One of the difficulties of constant communication in the Amazon basin is the incessant atmospheric electrical discharges, and to overcome this trouble a receiver has been designed, which is termed a triple balanced valve detector, in which are embodied most of the distinctive

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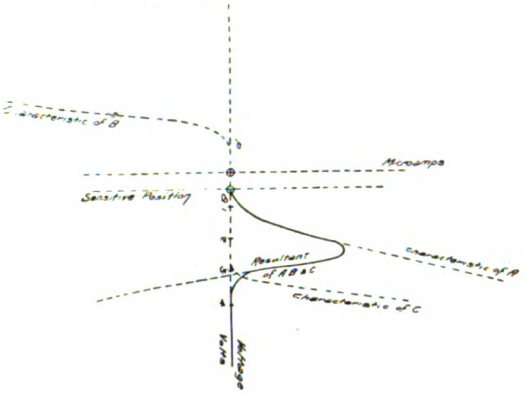
features of the receivers evolved by five years' working across the North Atlantic. This new receiver, in which is employed a low resistance intermediate circuit with low condenser




losses, consists essentially of three low-vacuum Fleming oscillation valves with special filaments. Although the instantaneous current value of the " x " is very much greater than the instantaneous current value of the signal, the total energy is not much more, and if two valves with identical characteristic curves be opposed one to another, and a third valve with a steeper characteristic curve be added in opposition to the first valve, we have the resultant shown in the diagram, signals being rectified to a certain value, after which the combination becomes conductive both ways. The " x's " being of a very high voltage are greatly reduced, and instead of coming in as crashing noises, are heard only as small, isolated clicks, and do not affect the reception of the musical note of the signals. By these and other means it is hoped efficiently to handle the expected addition to the already heavy traffic between the Porto Velho and Manaos stations.

During the voyage of the " Hildebrand " some very interesting results were obtained in the reception of the daily Poldhu press intelligence, and the news has been received on an exceptionally small ship aerial up to a distance of 2,606 miles, which leads to the assumption that in the near future the monotony of a voyage to the Brazils will be relieved by the introduction of the daily ocean newspaper system, which is such a feature of the present-day western ocean passenger trade.

In addition, from the time of leaving Liverpool until arrival at Para, we have every night been in touch both with Clifden and Glace Bay. So much for the technical features of the enterprise; but no note on the Brazilian installations would be complete without a reference to the nature of the country encountered.

For days past the good ship " Hildebrand " forged ahead at full speed up the great river, and the mileage by the chart is well over the thousand. It is hard to describe the effect upon the traveller of this wilderness of yellow water. The Rio Amazonas is the greatest

*Marconi Wireless Station at Porto Velho.*

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*General View of Manaos Station.*

area of virgin jungle in the world. In a broiling sunshine, it is difficult to realise that barely three weeks ago our party left Charing Cross in bitterly cold weather. The hot air reeks of vegetable decomposition. On either bank endless palisades of vivid, intensely green forest grow down to the water's edge, arrayed by countless varieties of clinging orchid and parasitic flower. Parrots fly screaming overhead; there is a quick scuffle of monkeys among the tree-tops, huge lepidoptera float by like sheets of orange and gold paper, and at one time we saw brown faces peering at us through the undergrowth as we passed. But it is when the purple robe of night descends and the Southern Cross hangs luminous over the sleeping forests, that eerie noises and the calls of prowling animals mingle with the gurgle and ripple at our bows, and hosts of winged insects arise from the swamps and investigate the ship. Human life in the torrid equatorial cities on the banks of the Amazon—that mighty mother of rivers—is extremely rich and full. The modern Brazilian strikes the visitor as being exceedingly wealthy. He builds vast mansions and furnishes them regardless of expense, and sprinkles his lawns with iron and marble statues. To sit outside a café in Para and watch the endless stream of automobiles passing is a revelation.

## The Uruguayan Decree

Commenting upon the decree which, as announced recently in the MARCONIGRAPH, has been issued, making it compulsory for all vessels conveying passengers between Uruguayan and foreign ports to have wireless telegraphic installations on board, the *Times* correspondent, writing from Montevideo, states that this decree will affect a considerable number of vessels of various nationalities for whom Montevideo is a port of call on their itinerary, but by no means the most important or one where they can look for passenger trade of any great extent. It is therefore doubtful how far they will care to comply with this somewhat peremptory decree, or whether they will not adopt the alternative of "cutting" a port that is already sufficiently unattractive on account of the high charges enforced. In the latter case it is the port itself that will suffer. No doubt, at no very remote date, all passenger steamers will be provided with wireless installations, but they are hardly prepared to take the step at short notice, at the bidding of the President of a minor South American Republic.

The opinion of the English shipping agents in Montevideo is that, whilst the step is a bold one, they approve the idea in itself, but think that at least double the time should be allowed before the decree becomes effective, and that it should not be made quite so drastic at the outset. No doubt if representations to this effect were made to the President in proper form, some mitigation might be obtained.

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## The Awakening of China

THE Chinese upheaval is one of the most significant political events of the period. Now that the progressive forces have secured the guidance of the destinies of the Empire, it is not too much to expect a rapid development of the vast resources which China is known to possess. Another direction in which an advance is likely to be made is in the provision of facilities for radiotelegraphic communications. The nucleus for this already exists, thanks largely to the foresight and enterprise of the Italian Naval authorities. It may come as a surprise to many to learn that in the matter of wireless telegraphy, China has already a history. At the time of the Boxer rising about ten years ago, the question of erecting wireless stations at Peking, Tientsin, and Taku was brought to the notice of the Chinese Government by Marconi's Wireless Telegraph Co. In 1904, fearing a recrudescence of the trouble, it was arranged to equip a station at the Italian Legation in Peking and another at the Italian Settlement in Tientsin. The late Emperor of China was present at the inauguration of the station in Peking, but the newspapers, or at least those which were at that date untouched by the spirit of modernity which has at last awakened in China, invoked their Deity to protect the Chinese people against European aggression! However, the stations remained; and not only did they remain in active service under the control of the Italian Navy, but they rendered very valuable assistance to the inhabitants of the two cities during the recent revolution. Everyone flocked to the stations for news from other parts of China. The Japanese Government sent a warship (fitted with wireless) to Taku, thus maintaining communication between the legations and the coasts. To render the service more effective, a number of Japanese sailors were instructed to operate the Peking Station, inasmuch as they were better able to communicate rapidly in Chinese signals. It is not difficult to understand how invaluable were the services of the wireless stations on the occasion referred to. The dread of death which filled the minds of foreigners dwelling in the disturbed areas was to no small extent assuaged by the knowledge that communication with the outer world was not interfered with; bankers and merchants could communicate with their clients and principals abroad. Telegraphic communications are invariably the first to fall before the fury of the sword or the ravages of fire, but the message transmitted from the wireless station emerges triumphant through the stress and turmoil of storm or battle.

It may be added that before the outbreak of hostilities the old regime had under consideration the question of the establishment of wireless telegraph communications, but owing to the unsettled state of the country they were unable to proceed. The enlightened President of the New Republic, Yuan Shih-Kai, has been favourably impressed by the success of the existing stations, and there is little fear that, under his able guidance and inspiration, China will lag behind other nations in this matter. In taking a further step towards the development of wireless communication in the Chinese Empire, they can gather splendid encouragement from the British Government and from the Governments of British Dominions across the seas, whose great scheme of wireless communications will, when completed, make for the more effective consolidation of the Empire.

## Mr. Marconi in New York

Referring to Mr. Marconi's visit to America, the New York correspondent of the *Daily Telegraph* sent the following despatch:

"Mr. Marconi's modesty is compelling the wonder and admiration of American Pressmen. He came here to prove that the United States Wireless Company has been infringing his patents, and the company surrendered almost without a struggle. But Mr. Marconi has not boasted about the victory, and he has not availed himself of the services of the publicity agent to boom his fame and his enterprises.

"Such self-effacement is almost incomprehensible here, where nearly everybody with goods or brains to sell has a highly paid Press agent, usually a clever reporter, whose mission in life is to keep the name of his patron in the public prints at all seasons and at all costs. Mr. Marconi has not suffered by his modesty, and it is a tribute to his genius to say that the reporters have sought him more zealously than any other recent arrival from Europe.

"Mr. Marconi told an interviewer that he believed the day of wireless wonders was only just dawning. 'I believe,' he said, 'that in the near future a wireless message will be sent from New York completely round the globe with no relaying, and will be received by an instrument located in the same office as the transmitter, in perhaps even less time than Shakespeare's forty minutes.'

"Most messages across the Atlantic, Mr. Marconi predicts, will probably go by wireless at a comparatively early date. 'In time of war wireless connections will be invaluable,' continued Mr. Marconi. 'The enemy can cut cables and telegraph wires; but it is difficult seriously to damage the wireless service. The British Empire has realised this, and is already equipping many of its outposts with wireless stations.'"

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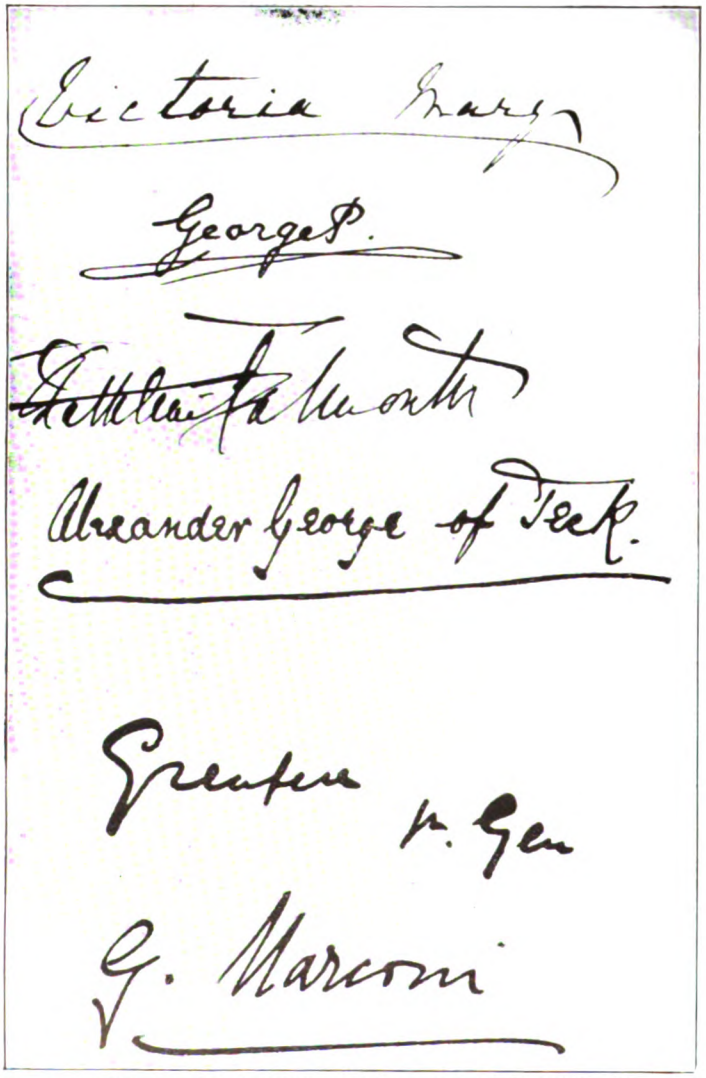
## Poldhu—An Impression

TWO steel poles, each 240 ft. in height, are being erected at the Marconi station at Poldhu, where the transmitting plant is being duplicated. The new set will consist of a turbine-driven alternator with direct current disc. Poldhu is destined to play an important part in communication with the newly-opened Spanish stations.

. . . .

To undertake a pilgrimage to Poldhu, one of the revered shrines of Mr. Marconi's genius, where the beginnings of transatlantic wireless telegraphy were made about eleven years ago, is no enviable task. Up to the present the Royal Geographical Society has neither sent me a medal nor even asked me to describe the hardships of the journey in a lecture; but learned bodies always move slowly, and it is possible that they are still incredulous of my exploit. The wooden towers are kept in sight during the greater part of the dreary drive from Helston to Poldhu, and the announcement that these towers are to be superseded by steel poles will occasion more than one passing regret to those who had come to regard them as symbols of a mysterious world.

A visit to Poldhu is like a visit to a world of unreality, where those things in life which we count the most real or material one by one drop into dreams. Landor was uttering no paradox when he exclaimed, "It was a dream! Ah, what is not a dream?" He was merely putting into one of those haunting lines in which he excelled a profound truth. Poldhu is entirely suggestive of a dream, and it emphasises the usual experience in life that the more of a reality to-day the more of a phantasm is to-morrow. An eminent scientist to whom electrical phenomena are a matter of everyday study, said in 1899: "No familiarity with the subject removes the feeling of vague wonder with which one sees a telegraph instrument, merely connected with a length of 150 ft. of copper wire, run up the side of a flagstaff, begin to draw its message out of space, and print down in dot and dash on the paper tape the intelligence ferried across thirty miles of water by mysterious ether." There was a time when such an achievement was mistaken for something convincing. To-



*Signatures of the Royal Party Visiting Poldhu on July 18th, 1903. (Preserved in the Mullion Hotel.)*

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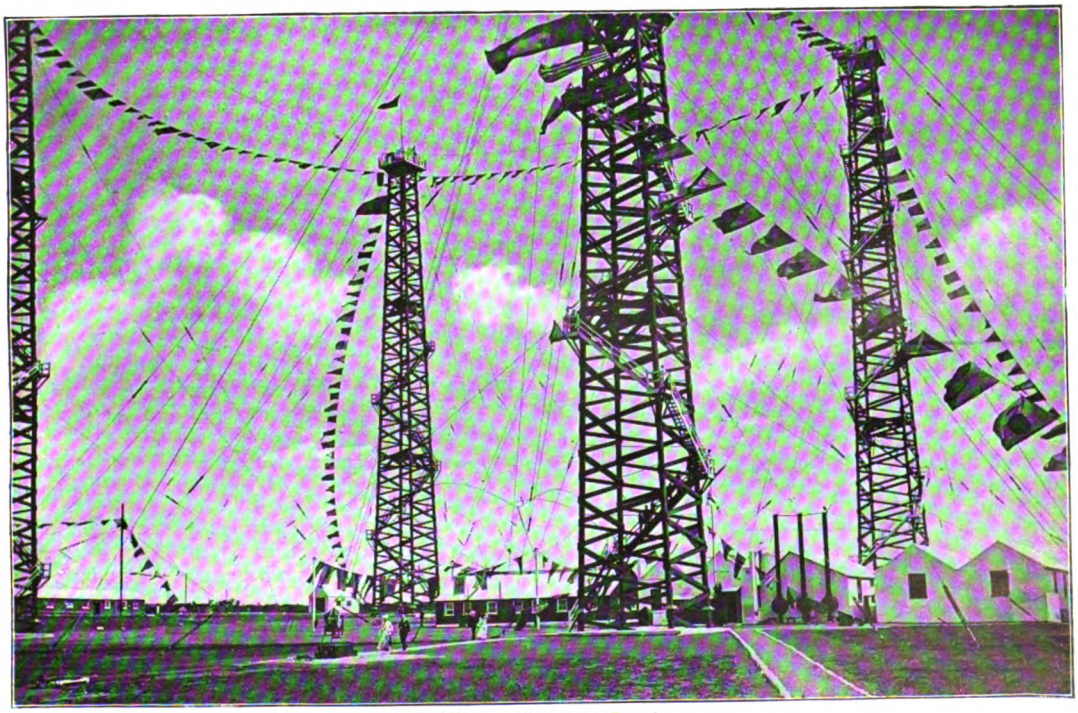
*Their Majesties (as Prince and Princess of Wales) on a visit to Poldhu Station, July 18th, 1903. Accompanying Their Majesties were Prince Alexander of Teck, General Lord Grenfell, Lady Falmouth and Mr. Marconi.*



*The Wooden Towers at Poldhu.*

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day, when the bridging of the Atlantic by wireless telegraphy is a mere commonplace matter, the achievement of 1899 pales into insignificance.

There is no glitter or movement at Poldhu such as gives an impression of reality; the station would seem to be formed and moulded by the country in which it stands. The hardness and bleakness of it, the inexpressible charm of it, the soft airs pungent with salt, above all the secretiveness of the low-lying buildings and impressive towers, standing on the black rocks jutting far out into the ocean, and lashed by sea foam of dazzling whiteness—all these tend to mystify one rather than to awaken the perception to the actual significance of the station. Then, perchance, occurs the memory of some great ocean tragedy, in which life and property have been saved through the timely intervention of wireless telegraphy, and at once there is awakened a full consciousness of the marvellous power of the modest-looking buildings, where are housed the apparatus and devices which deprive one of one's fear and detestation of the sea. To some the sea is a treacherous, restless, slimy creature, glorying in the griefs of humanity. The mysterious ether waves connecting ocean-going vessels with the shore rob the sea of many of its terrors.

As night descends upon the tranquil scene Poldhu station assumes a garb of suppressed animation The great Atlantic liners "stand by" in mid-ocean to receive the latest accounts of the day's happenings through this station, so that the roaming populations on board the large liners may be well versed with the world's affairs. That it should be possible to actuate an instrument from a distance of hundreds or thousands of miles, and oblige it at will to reproduce audible signals without the aid of any continuous artificial conductor, strikes the mind as being an achievement both wonderful and mysterious, and we return to grasp at the everyday dreams which we call hard fact. Shelley foolishly thought he could fathom the mysteries by escaping out of the twilight into the dark. He had the extraordinary delusion, when his friend plucked him out of the bottom of the river, where he lay like a conger eel, that in another moment he would have solved the riddle.

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To facilitate navigation at the mouths of the rivers Obi and Jenessei, orders have been given by the Russian Department of Posts and Telegraphs for the construction of wireless telegraphy stations on the island of Vaigatch and on the coasts of the Jaidaran Gulf and the Jugorski Straits.

## "Coffin Island"

### Wireless News from Pulpits

IN the Gulf of St. Lawrence, lying between Prince Edward Island and the west coast of Newfoundland, lies a group of thirteen storm-swept isles—the Magdalen Islands—connected with each other at low tide by sand bars. From November to May they are cut off from all communication with the mainland, except for an occasional wireless message, and no ship dare approach them during that season, on account of the lack of proper harbours.

An ominous title is that of Coffin Island, so called, however, from Admiral Sir Isaac Coffin, who received a grant of the whole group at the end of the eighteenth century; the title still being in the name of his descendants, who, according to various accounts, have the right to demand a rental of one shilling an acre, with the proviso that it be paid when convenient. There is a population of over three thousand, mostly French Canadians, who originally came from Nova Scotia, simple fisherfolk, who are protected by the Dominion Government from the intrusion of American fishing smacks within the three-mile limit.

As may be imagined, they are cut off from the outer world and its news during the winter season, and the Dominion Government has determined to remedy this privation. The Postmaster-General, Mr. Louis Philippe Pelletier, has engaged the editor of the *Quebec Chronicle* to write a news-letter of 1,000 words. Mr. David Watson will mail his news on Tuesday to the Marconi station at Pictou, from which it is to be transmitted to the receiving station at Grindstone Island.

The operator there will send copies to the Roman Catholic clergymen at Etang du Nord, Amherst, and House Harbor, who will translate the message into French. A copy will also go to the Church of England clergyman at Grindstone. On Sunday these news-letters will be read by the pastors to their respective congregations after service, and it is expected that from now on the churches will be packed to the doors.

The first week's budget of news, which somewhat exceeded the stipulated length, good measure being given to celebrate the occasion, touched upon the following subjects:

The passage of a Bill in the Dominion Parliament to pay the Grand Trunk Pacific Railway a Government subsidy of $10,000,000; the derailing of a train on the Grand Trunk Railway; the election of Yuan Shih-Kai as President of the new Chinese Republic; a report on winter navigation up to Quebec and the improvement of Quebec Harbour (both of vital interest to the islanders).

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## The Conquest of the Air
## Wireless Telegraphy and Aircraft

THE question of fitting aircraft with apparatus for wireless telegraphy is of increasing interest, as year by year these machines become a more reliable means of taking observations of military operations. The problem has been to design apparatus which will conform to the limitations of weight and provide an efficient aerial system for transmission and reception. Marconi's Wireless Telegraph Co. have of late given considerable attention to this problem, and have been conducting some important experiments with a view of solving the various technical problems. The field of the more recent experiments has been the Army aircraft factory at South Farnborough. Late in March an Army aeroplane went out for a short flight fitted with a clockwork V. sender, and from it good signals were received. Early in April similar experiments were carried out, and in these Captain Dawes, of the Air Battalion, went as a passenger, and transmitted his observations to the receiving station at the factory. The messages which he sent were very clearly received, and later the machine flew over an area of about three to four miles radius from the aircraft factory, and Capt. Dawes was able to report on the movements of troops manœuvring in the vicinity. These reports, which would have been of the utmost military value, were taken down at the receiving station, which was in touch with the aeroplane during the whole of the flight. On the third circuit Capt. Dawes himself received the messages which the Marconi operator transmitted from the aeroplane. The success of these experiments, which were for the purpose of demonstrating the efficiency of the special Marconi apparatus employed, proves that at a not far distant date the company may expect to maintain communication both ways with an aeroplane up to a radius of 100 miles.

A memorandum on naval and military aviation was issued during the month by the War Office, giving further details of the scheme which, in the debate on Army Estimates on April 4, Colonel Seely informed the House of Commons had been adopted by the Government, on the recommendation of the Committee which, under his chairmanship, had been commissioned to consider and report on the whole subject. At the central Flying School to be established on Salisbury Plain it is satisfactory to note that "signalling by all methods" will form one of the courses. The purposes for which aeroplanes will be required inland are: reconnaissance, prevention of enemy's reconnaissance, inter-communication, observation of artillery fire, and infliction of damage on the enemy. The total number of aeroplanes required for the seven squadrons of the military division will be eighty-four. As regards the use of airships for military purposes, the memorandum proceeds: "Careful consideration has been given to the question of whether airships should still be used for military purposes. The airship possesses the great advantage over the aeroplane in military warfare of being able to receive messages by wireless telegraphy; it is also able to transmit to greater distances."

## American Notes

WIRELESS amateurs in Cincinnati, Ohio, have organised a Jack Binns Club, which is to be a meeting place for the discussion of wireless matters.

The navy department have changed the name of four of its large wireless stations as follows: Cape Elizabeth to Portland Me., Point Loma to San Diego, Cal., Table Bluff to Urecka, Cal., and Unalaska to Dutch Harbour.

The navy department at Washington have adopted the word "radiogram" to designate a wireless message. Attention has been called to the fact that the words "radiogram" and "radiograph" have long been used in connection with X-ray work.

Postmaster-General Hitchcock has fixed 15 cents as the maximum rate per word that the United States may pay for wireless messages within the limits of the United States. No charge will be made for the date and the name of the place from which the message is sent.

The central offices and branches of the National Telegraph throughout the Republic of Uruguay are now transacting business through the radiotelegraphic stations, charging for the land service, including address and signature, 75 centesimos (26 cents) for the first ten words, and two centesimos for each additional word. The radiotelegraph charge is 10 centesimos for each word, with a minimum of ten words. The call signal is U.M.V. All private stations have been closed.

The Marconi Wireless Telegraph Company, of America, have received instructions from the California Atlantic Steamship Company to equip the s.s. "Stanley Dollar."

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# Maritime Wireless Telegraphy

*So, outward bound and homeward, through scene ye know by name*
*Observe the panorama that reeks of English fame ;*
*Do note the ancient landmarks just where they used to be*
*When your sublime forefathers arranged to rule the sea.*

O. SEAMAN.

✦

At a meeting of the North of England Steamship Owners' Association, a communication from the Board of Trade was received to the effect that a Bill has been presented to the Spanish Cortes having for its object the compulsory installation of wireless telegraphy on all vessels carrying passengers from Spanish ports on and after January 1st, 1913. The Secretary was instructed to request the Chamber of Shipping to raise objections as to the application of the measure to foreign vessels.

✦

We read in a morning paper on April 9th that "wireless telegraphy had again played a conspicuous part in a rescue at sea." It was the usual story. The American steamship "Ontario," of the Merchants' and Miners' Line, bound from Baltimore to Boston, took fire off Montauk Point at midnight on Sunday, April 7th. The news was at once despatched by the wireless operator, and received at the coast stations, when an immediate search was made for the blazing vessel. Two messages were sent :

"2 a.m.—Big fire below."

"2.45 a.m.—About to be beached near Montauk Point. Have to leave my key. Flames driving me from wireless room."

Tugs and revenue cutters started simultaneously from New York and New London in search of the "Ontario." Meanwhile the coast receiving stations got the following messages :

"3.15 a.m.—'Ontario' ashore 1½ miles from Point. Life savers gone to her."

"3.25 a.m.—Fire under control."

"5.20 a.m.—Fresh flames. Beyond control."

"6.10 a.m.—Life-savers now sending breeches buoy to take off passengers and crew."

"7.30 a.m.—All saved. Transferred. Tug."

✦

A peculiar interest attaches this month to our usual list of vessels which are being equipped with 1½-kw. and emergency plants. These include the following passenger and cargo vessels : "Letitia," the Donaldson Line ; "Wilcannia," the P. & O. Steamship Company ; "El Argentino," the Argentine Cargo Line ; "Hesperides," the Houston Line ; "Success," the Success, Ltd. ; "Parana," the R.M.S.P. Company ; "Colonian," the Leyland Line ; "Dimboola," the Melbourne Steamship Company ; "Chili" and "Peru," the P.S.N. Company ; "Ardeola," Yeoward Brothers ; "El Uruguayo," the British & Argentine Steam Navigation Company ; "Deseado," the R.M.S.P. Company ; and "Morwenna," the Dominion Coal & Iron Company.

*A Cargo Steamer forcing its way through a typical Atlantic Gale.*

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# From Convict Ship to Museum Wireless on the "Success"

By J. R. Stapleton.

THE mention of this incongruously named hulk awakens unpleasant memories of the tortures which criminals of a bygone age had to endure. Many, no doubt, have visited the "Success" as she lay in some port or near a seaside resort for inspection by pleasure-seekers, her grim hull beckoning to the public through gay adornments to come and bear witness to the methods which their ancestors adopted in the treatment of captured wrong-doers. In its new rôle this conspicuous vessel is making a strong bid for public favour, and it is not surprising that the aid of wireless telegraphy has been invoked to help it in its tour round the world.

*Arrangement of the Aerial on the Convict Ship "Success."*

It is claimed that the "Success" is the oldest ship in the world sailing under her own canvas, and the only convict ship in existence. The vessel contains such an amazing and diversified collection of relics that the time spent in studying them is amply repaid.

The "Success" was built as long ago as 1790, and, prior to being used as a show vessel, she had a most romantic career. She is not the first sailing ship fitted with wireless, for, as we announced some months ago, the "Mersey," engaged upon the more useful career of training cadets for the mercantile marine, made a tour round the world, in which the wireless equipment played an important part.

In view of the unique character of the "Success" it is appropriate to describe the wireless equipment, which differs from the ordinary ship installation, inasmuch as a cavalry transmitting set is used in conjunction with a standard ship receiving apparatus. The generator consists of a four-pole self-exciting alternating current dynamo, designed for an output of eight ampères fifty volts alternating current, and four ampères seventeen volts con-

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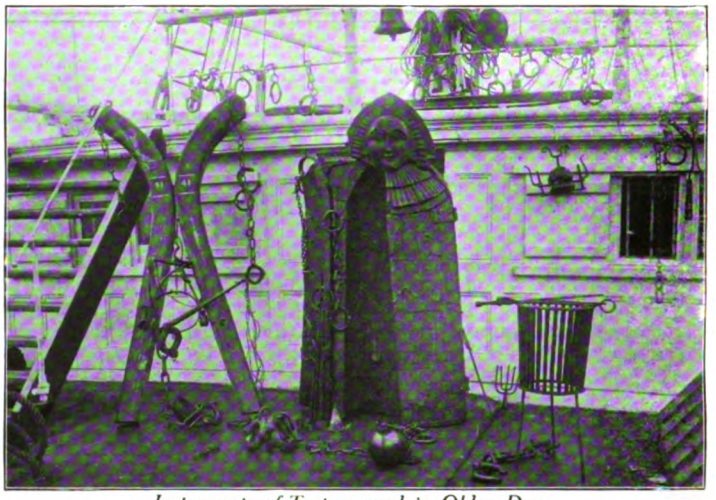
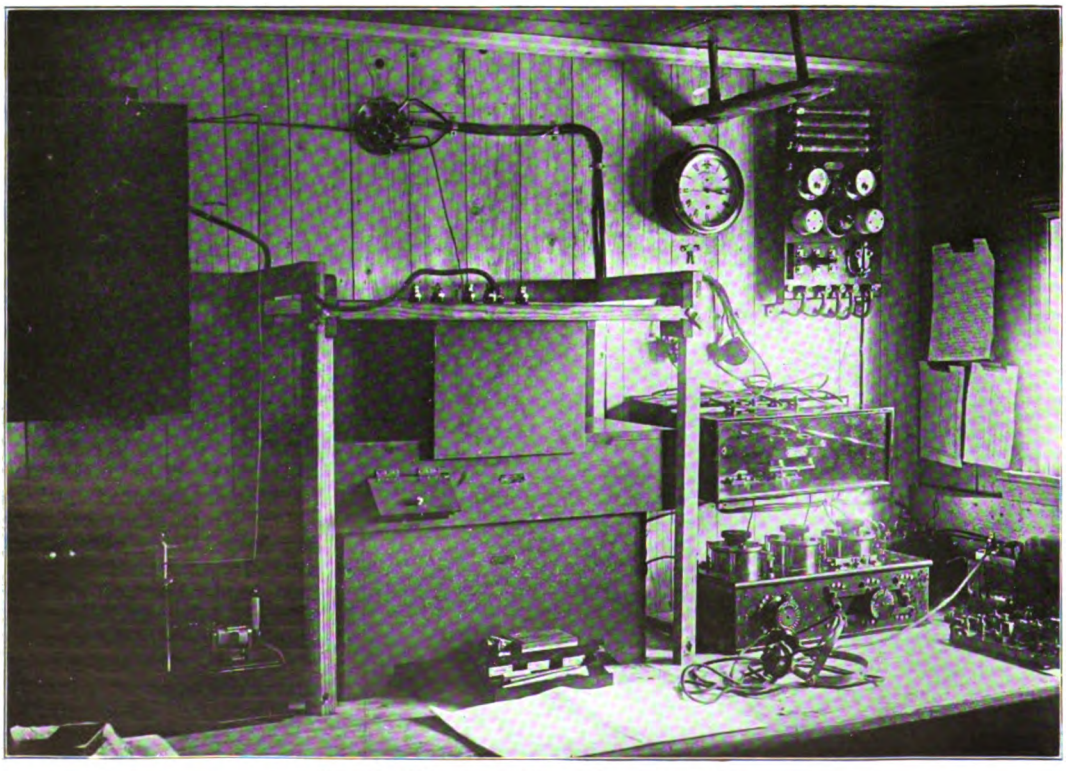
tinuous current, direct coupled to a double cylinder petrol engine. The alternating current supplies direct power to the cavalry transmitting set, whilst the direct current leads are taken through a specially designed switchboard for charging a battery of eight accumulators, the latter to be used with the emergency coil set. The battery is connected to a ten-inch coil through a manipulating key, thus enabling the apparatus to be worked whilst charging.

The receiving gear comprises a double magnetic detector and multiple tuner. Being a wooden ship, it was necessary to run special earth leads. These are composed of 30-ft. strip copper, running down the vessel sides and nailed on to the copper bottom of the ship.

Some difficulty was experienced in fitting the aerial to avoid the enormous amount of rigging employed on the vessel, but this difficulty was overcome by fitting the spreaders with iron bands to within a foot of the truck of each mast. This arrangement possesses



*Instruments of Torture used in Olden Days.*



*An Old Cell converted into a Marconi Cabin.*

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the advantages of allowing the aerial to pass clear of the topsails. An inverted L-shaped aerial was found to be the most practical type, and the down leads were brought from the mizzen mast on the port side to the Bradfield insulator to the forward end of the poop deck where the cabin is situated.

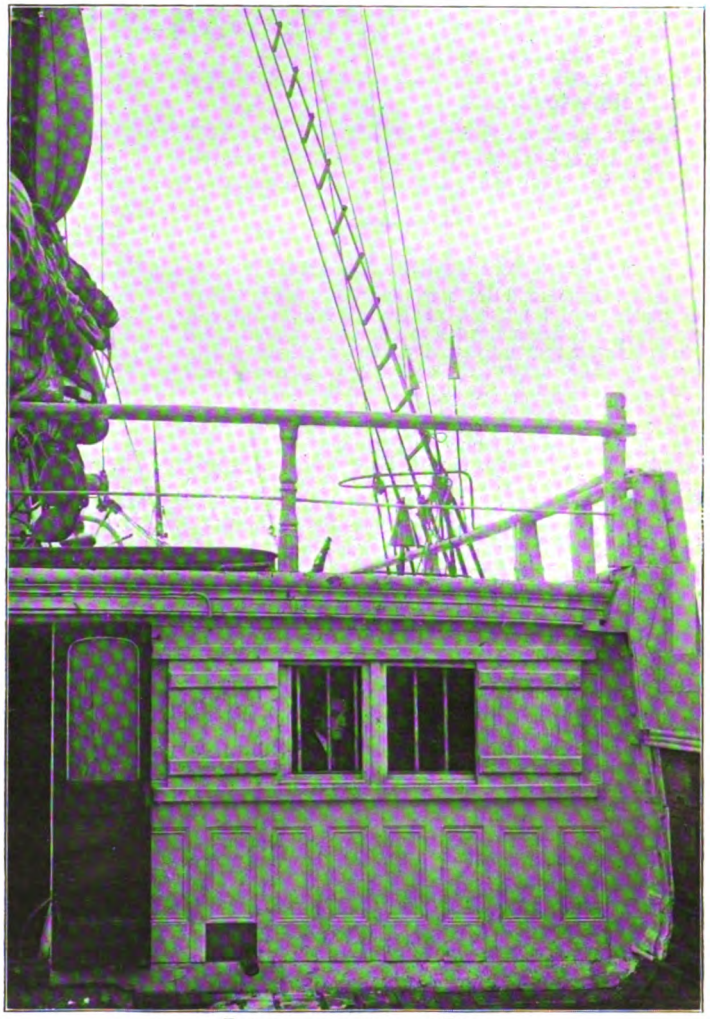
The cabin selected for the wireless apparatus was originally an old convict cell, and its history is such that we cannot pass it by unnoticed.

When the "Success" was stationed at Sydney as a receiving ship for transported convicts this cabin was used as a kind of "good behaviour" cell for convicts who had served fourteen years aboard, and had, either by good conduct or by special work, earned a little respite from the dungeon below deck. It was the haven sought after by all prisoners, and its popularity is explained by the fact that it was the only cell on board that admitted daylight or fresh air to penetrate its interior.

According to records which are carried by the vessel the long confinement of prisoners in dark dungeons deprived them of their sight, so that by the time an unfortunate inmate reached the reward of his good conduct by promotion to the upper deck he was unable to profit by it.

The most notorious character housed in one of the "black holes" was the bush-ranger, Harry Power. This desperado was condemned to the convict ship for many deeds of robbery and outlawry, but not for bloodshed, for it was his boast that he had never shed a drop of blood. It is even recorded that Power endeavoured to invoke the aid of the supernatural, so that a victim of his might part with his "bawbees" without being compelled to do so by the muzzle of a pistol. There is poetic justice in the fact that the iron key which spelt doom and despair to the unfortunate creature on whom it was turned should now be replaced by a key whose tappings dispel any sense of isolation.

It is the intention of the present proprietors of the vessel to exhibit her at New York during the whole of the coming summer, for the first few weeks at a convenient pier near the Brooklyn Bridge, and for the remainder of the season at far-famed Coney Island. Visits to Boston, Providence R.I., and other New England coast towns are planned to follow, and subsequently she will be taken to the Great Lakes. Later plans include visits to Philadelphia, Baltimore, Charleston, New Orleans, Galveston, etc., and then through the Panama Canal, and finally to San Francisco, where it is expected that the "Success" will arrive in time for the great exhibition four years hence.



*Exterior of the Marconi Cabin.*

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## Personal

Messrs. Joseph Chadwick & Sons, of Tower Buildings, Liverpool, have been appointed to act as representatives of the Marconi International Marine Communication Co., Ltd., for the Liverpool district for the sale and hire of Marconi wireless installation for use on board such ships as do not require a passenger certificate. While up to a very recent date the scope of maritime wireless telegraphy was limited almost entirely to the service of passenger vessels, it is now being extended to include cargo vessels, with results eminently satisfactory to owners.

Messrs. MacNaughton Brothers, of 190 West George Street, Glasgow, have been appointed to act in a similar capacity in their own district.

## Tool Makers at Dinner

Messrs. Drummond Brothers, the well-known company of machine tool makers, of Ryde's Hill, Guildford, entertained their employees to dinner on March 29th. No pains were spared to provide a thoroughly enjoyable evening. The toast of the company was proposed by the Mayor of Guildford, who remarked that their history read very much like a story from the "Arabian Nights." Twelve years ago the company was started with one man and a boy, and now they employed about 250 people. The chairman, Mr. E. E. Pullman, said that there were many virtues that the company might fairly claim, and not the least was their enterprise and their pluck in sending their mainstay round the world in search of new markets.

## Movements of Operators

G. J. Wright, from the "Dunvegan Castle" to the "Goth."

W. Groves, from the "Plassy" to the "Zealandic."

E. G. Hill, from the "Soudan" to the "Zealandic."

H. J. Belcher, from the "Galician" to the "Normannia."

R. C. Scott, from the Marconi School to the "Hantonia."

J. L. Lambert, from the "Empress of Ireland" to the "Ultonia."

T. Knox, from the "Athenia" to the "Cameronia."

E. J. Trail, from the "Cestrian" to the "Ionian."

W. D. Coysh, from the "Victorian" to the "Mongolian."

H. Hayes, from the "Irishman" to the "Scandinavian."

E. W. Dexter, from the "Mongolian" to the "Sicilian."

S. E. McLeod, from the "Arabic" to the "Numidian."

A. H. Jeffries, from the "Leinster" to the "Connaught."

L. A. Dods, from the "Worcestershire" to the "Derbyshire."

R. Sweetnam, from the "Suevic" to the "Elmina."

T. G. Barron, from the Marconi School to the "Empress of Britain."

F. H. Baker, from the "Huayna" to the "El Argentino."

L. A. Hancock, from the Marconi School to the "Mauretania."

F. James, from the "Mauretania" to the "Oronsa."

S. G. Rattee, from the "Empress of Britain" to the "Pannonia."

H. S. Bride, from the "Anselm" to the "Titanic."

A. S. Rawlings, from the "Armenian" to the "Minnewaska."

H. Kirby, from the "Megantic" to the "Armenian."

G. H. Sellars, from the Marconi School to the "Delaware."

K. S. Cawhey, from the "Lusitania" to the "Hilary."

H. E. Harrison, from the Marconi School to the "Lackawanna."

A. D. Hathaway, from the Marconi School to the "Megantic."

J. Starkey, from the "Virginian" to the "Mendi."

W. A. Woodhouse, from the "Orcoma" to the "Galician."

A. E. Osborne, from the "Franconia" to the "Victorian" (Leyland).

J. McKenna, from the "Baltic" to the "Virginian."

C. E. Rookes, from the "Teutonic" to the "Bohemian."

W. Merryweather, from the Marconi School to the "Carmania."

S. V. Branton, from the "Montfort" to the "Corsican."

W. J. Wing, from the Marconi School to the "Empress of Ireland."

R. H. Mountain, from the Marconi School to the "Franconia."

E. D. Mayer, from the Marconi School to the "Huayna."

S. Lemon, from the "Teutonic" to the "Orcoma."

J. M. Martin, from the "Carmania" to the "Suevic."

F. M. Bailey, from the "Corsican" to the "Worcestershire."

H. K. Gibsone, from the "Hubert" to the "Anselm."

L. A. Hancock, from the "Mauretania" to the "Cestrian."

A. Braddock, from the "Campania" to the "Hesperides."

A. Wilkins, from the "Laurentic" to the "Parana."

C. H. Crossman, from the Marconi School to the "Laconia."

J. W. Boadella, from the "Laconia" to the "Mauretania."

G. McCormack, from the "Ulster" to the "Munster."

C. W. Perkin, from the "Campania" to the "Adriatic."

A. Jamieson, from the Marconi School to the "Adriatic."

F. Skeet, from the "Adriatic" to the "Arabic."

R. McCutcheon, from the Marconi School to the "Arabic."

G. H. Sellars, from the "Delaware" to the "Caronia."

T. G. Barron, from the "Empress of Britain" to the "Colonian."

W. P. Marshall, from the "Arabic" to the "Delaware."

R. B. Darracott, from the Marconi School to the "Empress of Britain."

## Movements of Engineers

H. Dobell has returned from Spain, and H. M. Burrows from Clifden. Both are at present attached to the London office staff in connection with the Imperial scheme.

W. B. Cole has returned from Constantinople, and is temporarily attached to the London office staff.

A. Dalgairns and H. S. Tisshaw have gone to Clifden.

R. V. Ridges and F. C. Lunnon sailed for Glace Bay on April 25th.

E. G. Tyler and W. H. Venn have returned to London on the completion of the alterations to the P.O. station at Niton, Isle of Wight.

A. B. Blinkhorn is temporarily attached to the London office staff.

G. S. Whitmore has returned to England from Glace Bay, and is now on leave.

C. G. Rattray is on his way home from Soller.

O. Frost, having completed the installation on the Danish cruiser "Absalom," has returned to Chelmsford.

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THE MARCONIGRAPH

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# Wireless Telegraphy in Spain

## The King Honours Mr. Marconi.

MR. G. MARCONI and Mr. G. C. Isaacs, who visited Spain towards the end of May, were accorded a hearty welcome. An elaborate programme of entertainments had been provided for the guests, who were received with the utmost cordiality in Ministerial, scientific, and commercial circles. His Majesty the King of Spain presided over a brilliant gathering at the Athenæum Club in Madrid on May 19th, when Mr. Marconi delivered a discourse on the history of wireless telegraphy in the presence of leading representatives of the Government, Members of Parliament, the British and Italian Ambassadors in Madrid, and other influential representatives of politics, science, and art. King Alfonso received Mr. Marconi in audience on the following day, and conferred upon him the distinguished honour of the Grand Cross of the Order of Alfonso XII. Among those who entertained the visitors was the Compañia Nacional de Telegrafia Sin Hilos (the Marconi Company of Spain), who gave a banquet, at which there were two hundred guests present, including the Ministers of the Interior, Finance, Justice, and Public Works, Señor Moret (former Prime Minister), and the British and Italian ambassadors. All the newspapers of the capital, and the provincial press, printed glowing eulogies of Mr. Marconi, and devoted a good deal of space to accounts of the receptions given in honour of himself and Mr. Isaacs. The visit has furnished another proof of the keen interest which the commercial development of wireless telegraphy has aroused in the highest circles in Spain, and augurs well for the future of the Marconi system in the Iberian Peninsula.

Spain is already provided with an extensive system of internal and external wireless telegraphy, the central station for which—at Aranjuez—was opened by H.M. King Alfonso on January 27th. All the stations were erected by Marconi's Wireless Telegraph Company on behalf of the Compañia Nacional de Telegrafia Sin Hilos, and they are situated at Cadiz, Teneriffe, Las Palmas, Barcelona, Vigo, Soller in the Balearic Islands, and Alicante. Before being put into service, the completed stations were subjected to very severe tests by an expert independent commission appointed by the Spanish Government. There is no harm in mentioning now that, before seeing the stations in operation, the members of the Commission were rather sceptical as to the possibility of the wireless service emerging with complete satisfaction from the trials to which it was to be subjected. The performance of the stations in the matter of accuracy, speed, and reliability entirely changed the opinion of the Commissioners, who expressed their great satisfaction with the service rendered by the stations. In actual practice, the Spanish wireless service has amply maintained the golden opinions which it gained during its period of trial. What need is there to recall the inestimable value which the wireless service rendered to the State only a few weeks ago, for is it not still fresh in the public mind—and especially in the grateful recollection of the people of Spain—that when the cables and land lines broke down before a gale, the Marconi stations remained unaffected, and maintained the continuity of the telegraphic service? Little wonder, then, that all sections of the community—politics, science, art, and commerce—should join with their Sovereign and other members of the Royal House in paying homage, when in their midst, to the man who has made all this possible, and who compels admiration for the beneficent results of his marvellous discovery, and for their ready application to the requirements of mankind.

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THE RT. HON. SYDNEY BUXTON, M.P.

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# The Right Hon. Sydney Charles Buxton, M.P.

## President of the Board of Trade

"THE word politics, sir," said Mr. Pickwick, "comprises in itself a difficult study of no inconsiderable magnitude." Since the subject of our sketch this month is one who for many years has been deeply immersed in that study, we need offer no apology for citing Mr. Pickwick, especially as his observation is one which no thinking man will dispute. Mr. Sydney Buxton has enjoyed a very lengthy career in the political and parliamentary arena. He first entered the House of Commons as member for Peterborough in 1883, after having unsuccessfully contested the Boston division three years earlier. In 1886 he was elected member for Poplar, and has since represented that East London constituency with honour and distinction. Last year, when he celebrated the twenty-fifth anniversary of his election for Poplar, representatives of all shades of political opinion in the constituency combined to pay homage to their member, and to present him with a suitable token of their goodwill towards him.

Mr. Buxton was educated at Clifton and at Trinity College, Cambridge. From 1876 to 1882 he was a member of the old London School Board, and while on that body he carried out a good deal of social work. He was a member of the Royal Commission on Education from 1886 to 1889, which latter year will always be notable for the distinguished services which Mr. Buxton rendered in bringing about the termination of the famous Dock Strike. From 1892 to 1895 he acted as Under-Secretary for the Colonies in Lord Rosebery's ministry, and in 1904 he was appointed a member of the Income Tax Committee. When the late Sir Henry Campbell-Bannerman formed his ministry in 1905 he appointed Mr. Buxton as Postmaster-General, an office which he continued to hold until 1910, when he was appointed President of the Board of Trade by Mr. Asquith.

As Postmaster-General, Mr. Buxton has had a great deal to do with legislation affecting wireless telegraphy; and, as he himself declared in the House of Commons only a few days ago, the question of wireless was one in which he had taken a very great interest. When at the Post Office he made a purchase for the nation of all the wireless stations throughout the country. It is a singular coincidence that the subject of wireless telegraphy should again claim his attention in his new office. Two years ago a Departmental Committee of the Post Office, the Admiralty and the Board of Trade was held when the question of enforcing compulsion on ships in regard to wireless was discussed, and the conclusion arrived at was that the matter was premature. Mr. Buxton's attitude is one which is wholly in keeping with his wise statesmanship. He felt that it would have been a mistake in the early days of wireless to have had compulsion. In those days the system was still developing, and shipowners would have had cause to complain if the Government had insisted upon their adopting a system of wireless without being able to show that they would be able to obtain an efficient and proper service. The position now is very considerably changed, as readers of this journal know. The Government, after very careful consideration and investigation of other so-called systems of wireless telegraphy, have embarked upon a great Imperial scheme of wireless communication which has been made possible by the work of Mr. Marconi.

The labour troubles which have disturbed the industries of this country during the past twelve months have naturally thrown a considerable burden of work upon the department over which Mr. Buxton presides, but whether in the House of Commons or in the committee room, Mr. Buxton has displayed a wonderful grasp of the problems, and has brought to bear upon their solution a clear mind and a conciliatory spirit. His work during the railway crisis last year will not be forgotten for many a long day, while in the more recent miners' strike, he, together with the Prime Minister and the other members of the Cabinet, took a great share in restoring peace. Mr. Buxton, while at the Post Office, was responsible for many important reforms, and he will live long in the grateful recollection of the Anglo-Saxon people for his introduction of penny postage to the United States of America and the Canadian magazine post. Mr. Buxton has written considerably on social and political questions. His "Handbook to Political Questions," which has run into nearly twelve editions, is a masterpiece, and his "Political Manual" runs it very close as a valuable work of reference. "Finance and Politics"; "An Historical Study, 1783-1885"; "Handbook to Death Duties"; "Mr. Gladstone as Chancellor of the Exchequer"; "The Fiscal Question," and other works have also come from his facile pen.

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# The International Radio-Telegraphic Convention

AS announced in the May issue of THE MARCONIGRAPH, the International Radiotelegraphic Convention will open in London on June 4th, and will continue until July 2nd. All countries who have ratified the Berlin Convention will be represented at the gatherings in London, and the associated Marconi companies will be officially represented at the deliberations of the conference. The representatives of Marconi's Wireless Telegraph Co., Ltd., will be Mr. G. Marconi (Chairman), Mr. Godfrey C. Isaacs (Managing Director), and Mr. W. W. Bradfield (Manager). The meetings of the delegates will be private, and the main business will be the work of revising the Convention as it stands at present. The existing Convention deals only with wireless communication between ship and ship and between ship and shore. At the forthcoming conference resolutions are to be proposed urging the need of legislation for the regulation of wireless telegraphic correspondence with fixed points. According to a French report, among other questions to be discussed will be the organisation of a time service and the definition of aerial radiotelegraphic stations. The British Post Office have arranged a series of excursions and entertainments to render the visit of the delegates to this country as enjoyable as possible, and in the programme are included a visit to the new Marconi works at Chelmsford, and to the Marconi station at Poldhu.

The Postmaster-General announced, in the House of Commons on May 21st, that the following gentlemen had been appointed as British representatives at the forthcoming International Radiotelegraphic Convention :

Sir H. Babington Smith, K.C.B., C.S.I.
Mr. E. W. Farnall.
Mr. R. J. Mackay.
Mr. F. W. Horne.
Commander F. G. Loring, R.N.
Capt. E. F. B. Charlton, Ad.C., R.N.
Commander W. R. W. Kettlewell, R.N.
Lieut. John A. Slee, R.N.
Lieut.-Col. J. M. W. Macdonogh.
Major R. H. H. Boys, D.S.O.

Australia, Canada, India, New Zealand, and South Africa are sending special representatives. The interests of other British possessions will be looked after by the British delegates. Canada will be represented by Mr. C. J. Desbarats, deputy minister of the Navy, and by Mr. C. P. Edwards, superintendent of wireless. These gentlemen will be able to report that wireless has made substantial progress in Canada.

France will be represented by several delegates, each of whom is to have a deliberative vote. The first and principal French delegate will represent the Mother Country, while others will represent French Indo-China, French West Africa, French Equatorial Africa, Madagascar, and Tunis. The importance which the French Government attaches to the Colonial interests of France as regards wireless telegraphy is marked by this special representation of French colonies at the conference. The French deputation will consist of M. Frouin, Chief of the Telegraphic Department, president of the deputation; M. Belugou, Chief of the Third Bureau of the Telegraphic Department; M. Poulaine, of the International Telegraph Service; M. Bouchillon, telegraphic engineer; Major Ferrie, of the Army Engineers; M. Lacombrade, Major Cartier, Captain Fossey, Lieutenant Paty du Clam, M. Duchêne, M. Morgot, M. Michel, and Captain Brenot. M. Lacombrade will act as secretary to the deputation.

It is understood that the Russian Government has appointed M. de Etter, Councillor of the Embassy in London, to be the chief delegate of Russia at the Convention. He will be assisted by eight delegates—Prof. Ossadtchü, Assistant Postmaster-General, and Col. Eulez and M. Sergevitch, of the Home Office; Col. Baron Vinecken and Lieut-Col. Sokoltgow of the War Office, and Lieuts. Schmit, Dmitriew, and Stchnastnü of the Russian Imperial Navy.

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Mr. Hugh Law, M.P., asked the Postmaster-General whether he was aware that the fishermen of Tory Island, Co. Donegal, have suffered loss in marketing their fish owing to the breakdown of the cable connecting the island with the mainland, and what steps are being taken to have the cable repaired.

Mr. Herbert Samuel replied : I am inquiring as to the advantages of substituting a wireless installation for the cable which is now broken down, and will inform the hon. member as soon as a decision has been arrived at.

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# Questions in Parliament

SIR E. Cornwall asked the Postmaster-General, on April 30th, whether he was prepared to arrange for the public use of the Marconi wireless system between this country and America. Mr. Samuel replied that, on application from the Marconi Company, he had made arrangements to accept from the public, on and from May 1st, at all telegraph offices in the United Kingdom, telegrams addressed to places in Canada and the United States, for transmission by the company's wireless Transatlantic service. The company, he said, notified that the full rate for telegrams sent by their route to New York or Montreal would be 8d. a word, the rate for cablegrams being 1s. a word, and that there would be a similar reduction in the full rates for telegrams for other parts of America. For deferred telegrams in plain language the rate to New York would be 4d. a word, the cablegram rate being 6d., with corresponding reductions for other places.

* * * *

The Postmaster-General, Mr. Herbert Samuel, informed Sir C. Kinloch-Cooke, in the House of Commons on May 1st, that a conference of representatives of the Governments which have adhered to the International Radio-Telegraphic Convention would be held in London in June. This, he said, would afford an opportunity for discussing the best means of rendering more effective the service of wireless telegraphy for the purpose of saving life at sea. Mr. Samuel added that he was considering the best method of bringing the whole question before the conference.

* * * *

Mr. Douglas Hall asked, on May 6th, if the Postmaster-General would decline to grant any new licences to establish wireless telegraph ship stations or any extension of existing licences until after the Wreck Commission appointed to inquire into the loss of the "Titanic" had issued its report and recommendations unless a proviso was inserted that at least two competent Marconi operators were carried on each ship so licensed. Mr. Samuel said he was in communication with the Board of Trade on the matter. He fully realised its importance and urgency. Existing ship licences did not expire until December, 1912.

* * * *

Mr. Samuel informed Mr. Vincent Kennedy, on May 6th, that there were no official regulations covering the hours of duty of Marconi operators. The conditions of employment were matters of arrangement between the company and the shipowners. No condition was imposed on Marconi's Wireless Telegraph Company necessitating a non-interceptible message service. Such a condition would be impracticable. All wireless telegraph installations on board British ships were capable of being used for inter-communications with other systems, and they are worked in accordance with licences issued by the Post Office. The Radio-Telegraph Convention did not provide for the compulsory interchange of messages between ships for other than distress purposes, and he understood that the Marconi Company declined to inter-communicate, except in cases of distress, with ships fitted with other systems, unless the matter had been arranged by agreement.

* * * *

Major Archer-Shee wanted to know whether the "Titanic" Court of Inquiry would have power to report, under Section 466 of the Merchant Shipping Act of 1894, on the culpability or otherwise of the Board of Trade itself in neglecting to issue any regulations whatever for the efficient conduct of wireless communication between passenger ships flying the British flag. Mr. Buxton, in reply, said that among the questions submitted to the Court was the question of wireless telegraphy, and the best method of dealing with the question of wireless, as applied to ships, was receiving very careful attention. He pointed out to the hon. member that there were existing rules and regulations which imposed regulations in regard to "wireless" on British ships, especially in regard to messages from ships in distress.

* * * *

On May 8th, Mr. Norton-Griffiths asked the Postmaster-General whether the legal advisers to the Crown had provided a clause in the contract now being considered with the Marconi Company by which the Government should not be precluded from taking up or controlling any other system of wireless telegraphy that might prove more efficient for long-distance transmission. Mr. Samuel pointed out that the contract with the Marconi Company would meet the contingency referred to by the hon. member. To the inquiry of Mr. Lynch, whether he would take into account experiments which were said to be carried on in other countries, Mr. Samuel replied that if the Government had to wait until wireless telegraphy had been absolutely perfected, the Imperial Wireless Scheme would never be established.

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*Outside View of "Marconi House" from the Strand, showing the Main Entrance and Telegraph Office at left.*

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# The New Home of Wireless

## Opening of "Marconi House"

ON May 16th Marconi House was formally opened for business. The conversion of the building to suit the requirements of Marconi's Wireless Telegraph Co., Ltd., was done in exceptionally quick time. The company only came into possession on March 25th, and in well under two months a dismantled restaurant has become a handsome suite of business apartments. The actual area of the site is about 54,500 feet. The premises were formerly used as a restaurant and residential flats, and an adjoining tavern has been converted into a telegraph office.

The premises now occupied by the company as their headquarters in London are in the Strand, and are bounded on the north by Aldwych. Forty-eight years ago the site near which Marconi House now stands commenced to be famous. It occurred to some syndicate that the main thoroughfare in London was in need of enlivenment, and the "Strand Musick Hall" was the immediate result. The new

*The Main Waiting Hall.*

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building nominally followed the style of Continental Gothic, and was declared by some to be a building of considerable beauty and tasteful construction. It opened with promenade concerts and a band of thirty-six performers. Signor Tito Mattei, pianist to the King of Italy, was one of the principals, and vocalists of international reputation were engaged to sing. The place, however, did not prosper, and it closed its doors on November 30th, 1866. Two years later it re-opened under new management, and before it closed in July, 1903, the once extolled playhouse had grown gradually out of date. Yet there was a sense of compactness and charm about the old Gaiety, which, like Aladdin's lamp, was finally changed for a new one. Of the company which performed in those days, Mr. Richard Barker, Mr. Joseph Eldred and Miss Nellie Farren are now dead. Other tender memories are Kate Vaughan and Fred Leslie.

In 1903 the New Gaiety Restaurant and Hotel took the place of the old theatre, and this in turn has made way for the headquarters of one of the most important commercial undertakings of the century. The architectural features of the building have been retained. In exterior treatment the imposing massive proportions of the Florentine period of the Italian Renaissance were adopted, upon the suggestion of Mr. Norman Shaw, R.A. The bold masses thickly fenestrated and surmounted by the interesting carved frieze cannot fail to attract the attention of passers-by as being one of those restrained, yet dignified, efforts of a great artist in architecture. The artistic atmosphere of the whole design strikes one immediately on entering the main waiting hall near the entrance. This is panelled in the most beautiful fashion with Honduras mahogany, the fireplace being a great feature of the design. The frieze is a deep plaster cast setting, and the ceiling is richly ornamented. On the left-hand side of the hall is a small counter at which

*The Transfer Department (on the Ground Floor).*

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*Public Telegraph Office (Strand Entrance).*

marconigrams can be received for transmission to all parts of the world. Next to that is a public telephone for the use of visitors waiting to keep appointments. The main lift is capable of carrying twelve passengers, excluding the lift attendant. On the right hand of the waiting room is a telephone exchange containing three switchboards, one fitted with 100 lines for the inter-communication system of telephones, and the other two being Post Office wires, each having five extra points and fifty extensions, making a total of ten extra lines and one hundred extensions. Past the telephone exchange is another set of large doors, which communicate with the Aldwych side of the building. These doors are used by the staff. On the same floor is a large room, 60 feet by 40 feet, which is used as the Transfer Department. This room is fitted with a Honduras mahogany counter, equipped with three solid bronze grilles, in which are received the share certificates, vouchers, etc. All the desks in this office have been specially made by the Shannon Company. These are 6 feet long. The office is decorated in white, with a fine balcony running all round it, on which are employed about twenty dictaphone typists. From this balcony is an electric lift, communicating with each floor in the building, for the conveyance of dictaphone records. The whole of the electric light fittings in this room are of solid bronze, penny metal. In all, the staff employed in this room will be about twenty, so that, compared with the floor space, it will be seen that each man is provided with ample space. The postal room is situated at the end of this floor, and opens on to the street through a set of doors at which the mails are delivered. This room is also used as the central exchange for the Lamson pneumatic tube system, which is installed throughout the offices. Another large room has been reserved on the Aldwych front (which was originally known as the Dutch Bar) for

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extension of the Traffic Department. On the Aldwych side there is another entrance which was originally used by persons occupying flats on the upper floors. Here is a large lift which is used by members of the staff who occupy offices on the Aldwych side of the building.

To the right of the main entrance off the Strand what was once a tavern has been converted into a telegraph office, which is open night and day to receive marconigrams. This office is connected by means of a private wire to the Marconi station at Clifden, where Transatlantic business is dealt with. As a result of this private wire, the relaying of messages between London and Clifden is abolished, and marconigrams intended for all parts of the United States and Canada are now transmitted at a considerably increased speed.

The grand staircase leading from the waiting room to all floors is 10 feet wide, and inserted on each landing are some very fine stained glass windows. The motto under the window on the first landing is, "I'll put a girdle round about the earth in forty minutes."

On the first floor is a large room overlooking the Strand, which is used by the managing director. This room has been furnished and decorated in the Adam style, the whole of the electric light fittings and other metalwork being in solid bronze. The walls have been panelled with rich mouldings, the panels painted a pale sage green, and the mouldings coloured a scrambled white. The fireplace has a marble hearth and surround, and the grate and cheeks are of polished steel with bronze enrichments. Adjoining this room is the manager's office, which has been decorated in similar style. The mantelpiece is in carved mahogany, and the grate and cheeks in polished steel and bronze. The room adjoining this is used by the private secretaries and their assistants. In this room is also situated a pneumatic tube station. The large hall on this floor will be used as another waiting room.

*Accountant's Office with Gallery used by Draughtsmen.*

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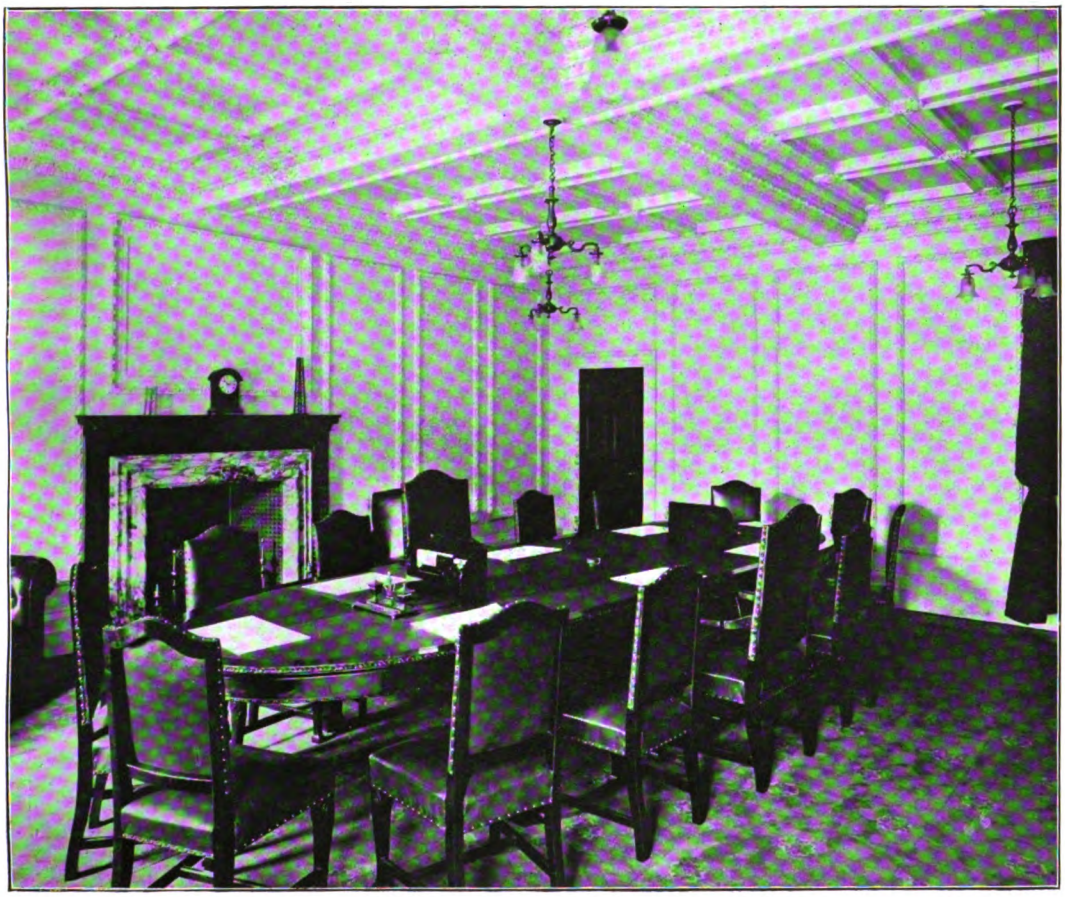

*The Board Room.*

Another flight of stairs leads to the second floor. On the right are the rooms occupied by the secretary, the assistant secretary, and their typists, and the Board Room.

The latter has been tastefully and skilfully decorated, an entirely new ceiling having been put in. This suite of rooms was originally the lower portion of the Masonic Temple, which had plaster columns and a domed roof. These have been cut out, and a new floor inserted. It is on the under side of this new floor that the Board-Room ceiling has been fixed. The electric light fittings here are also in solid bronze of a special design. To the left of the landing is the Accountant's Department, which is of similar dimensions to the Transfer Department—namely, 60 feet by 40 feet. This was formerly used as a ballroom, and was provided with a spring floor. To adapt the floor to its present requirements the springs have been wedged up and secured. A subsidiary staircase leads to another balcony, which is used by draughtsmen. The ceiling is domed, and highly enriched with fine plaster work. Thirty-two new desks, each 10 feet long, have been provided, giving accommodation for sixty-four clerks. At the back of this office are the store-rooms, lined with adjustable bookshelves, on which papers can be stored, and a large lift is installed, by means of which all books are conveyed to the strong room. Divided from this room by means of Honduras mahogany screens are the offices of the accountant, the assistant-accountant, the cashiers, and their typists.

On the third floor are the offices of the technical staff, consisting of the chief engineer, the assistant engineer, other engineers, and technical clerks. These rooms overlook the Strand, and are partitioned off by means of Honduras mahogany screens, and are situated on the new floor which has been inserted—this

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*Mr. Marconi's Room.*

was formerly the upper portion of the Masonic Temple.

A very light room on the right-hand side of the large waiting room is used by the chief draughtsman and drawing-office staff.

On the fourth floor the offices facing the Strand are occupied by Mr. Marconi, Mr. Marconi's private secretary, and the Patent Department. The other rooms on this floor have been allotted to the Field Station Department, THE MARCONIGRAPH, the Publicity Department, and the Stationery Department, while the rooms overlooking the Aldwych side have been apportioned to first-class engineers, foreign agents, auditors, etc.

The fifth floor is occupied by the traffic manager and his staff. These offices lead up to the Ship Fitting Department, the chart room, operators' and inspectors' waiting rooms, etc.

A portion of the sixth floor has been reserved for the use of the housekeeper.

On the seventh floor there will be a large workshop and a room in which drawing-office tracings will be printed, also a dark room for photographic work, a drawing office, four large show rooms where working sets can be demonstrated, and all types of storage. An aerial system will eventually be placed on the roof for demonstration purposes. Other rooms on this floor are being equipped as a training school for operators.

The heating apparatus employed in the building consists of two boilers, each 11 feet by 6 feet diameter, which are used for heating and driving pumps. The heating system is a low-pressure one of 5 lb. per square inch. Three pumps are used for pumping surface water and return condensation water to boilers. Originally the boilers were fed directly off the mains, and in the course of reconstruction four bushel baskets of sand were removed. Under the system now adopted the same water is used over and over again, thus obviating the consequent collection of sand. The sewage pumps are merely used for waste and surface

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water which collects in the cesspools. The electrical mains enter in one of the vaults under the Strand, the current feeding these mains being supplied by the Charing Cross Electric Light Company. The current comes in at 200 volts D.C., and at this voltage it supplies the whole of the lighting throughout the building. The wiring is in parallel, and in addition there is a separate circuit, known as "police lighting," which allows the main lighting to be shut off, and to leave a scattered circuit about the place, giving the necessary amount of light for a night watchman. The main fuses are 150 amps, and the remainder of the lighting is on distribution boards running from small fuses averaging from 5 to 10 amps. Two electric signs ("Marconi House") are run off the basement lighting. The lifts and sewage pumps are operated by electric motors. The inter-communication telephones, of which there are nearly 100 extensions, have been supplied by Messrs. W. G. Hodgson & Co., who have also carried out the installation of electric bells and fire alarms. Twenty-four fire hydrants are distributed about the building, and a large gong is placed at each hydrant. A day and night fireman will be in attendance. The architects were Messrs. Dunn & Watson, of Lincoln's Inn Fields; and the surveyors, Messrs. T. M. Deacon, Son & Addiscott, of 32 Craven Street, Charing Cross, London. The builders were Messrs. Trollope & Colls, who have carried out the whole of the alterations and made all the joinery and mahogany screens, including the accountants' desks, within record time. The Shannon Co., Ltd., supplied the desks for the Traffic Department. The lifts are by Messrs. Waygood & Company, and have been thoroughly overhauled and improved. Messrs. F. Geere Howard, of Berners Street, have carried out the electric lighting work, and the signs are by the Electrical Name & Numerical Sign Co., Ltd. The furnishing was carried out by Messrs. Hampton & Sons, Ltd., and Maple & Co. Magneta clocks have been installed in each room.

About nine miles of wire was used in connection with the telephone extensions, and four miles for the bells and indicators. The fire alarms required about two miles of wire; 4½ tons of white lead were used in the building, and 120 gallons of Rippolin. The number of men employed on the job averaged 450. About ten weeks ago the company were in negotiation with the London County Council for the acquisition of the premises, so that the work of adapting the premises to their present needs has been carried out in a wonderfully short time. Another point to be remembered is that the removal from the old premises took place without any interruption in the work of the staff.

## Safety at Sea

### A German Conference

A CONFERENCE of shipowners was held in Berlin on May 6th in order to discuss means for ensuring safety at sea. The Minister of the Interior, Herr Delbruck, who presided, made a short introductory speech, in which he said that the object was not so much to take final decisions as to refer, after discussion, some or all of the five subjects in question to a special committee which would work out the suggestions for international discussion. Each of the five subjects was then discussed upon the basis of the reports drawn up at the preliminary conference between the Seeberufsgenossenschaft (Marine Association) and the principal German shipping lines or on the basis of the regulations of the Seeberufsgenossenschaft, or of the Maritime Code. The first two subjects—security against sinking of damaged steamers and the provision of boats—were referred to special committees, which will prepare suggestions dealing respectively—first, with the question of watertight compartments, pumping, and kindred subjects; secondly, with the size of boats, their portability, capacity, and so on.

Regarding the third subject—wireless telegraphy—a number of recommendations were made in the report from the preliminary conference:

First, that the receiving apparatus on board ship should be watched day and night, so that any message from a ship in distress might be taken by all ships within her radius.

Secondly, that all steamers should be ready to receive signals from ships requiring help, even when they are engaged in communication with the land.

Thirdly, that of all telegraphic communications by sea wireless signals of distress should have precedence.

Fourthly, that means should be considered to secure the continued generation of electric power to the apparatus even when the main battery should be under water or out of order.

Lastly, that as far as possible spare instruments should be carried as substitutes for wireless appliances which might be damaged or destroyed.

A special committee was appointed to consider these recommendations. The subjects of "ice reporting" and steamer routes were both referred to this wireless telegraphy committee, which will be assisted in these subjects by nautical experts. It is observed that before the committees submit their reports the official English inquiry on the "Titanic" disaster will probably have been completed and provide fresh material for discussion.

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# New Apparatus for Cargo Vessels

## ½-k.w. Marconi Set

THE manifold advantages of wireless telegraphy in connection with shipping have already been demonstrated in a variety of ways; in some cases wireless telegraphy has been instrumental in saving numbers of lives, and in others of large amounts of valuable property. It has already been applied to all general purposes in connection with the larger classes of steamships. The labour upheaval which took place in this country some months ago, and in which shipping was so largely concerned, pointed to another useful purpose to which wireless telegraphy might be applied if all classes and sizes of vessels were fitted with the apparatus. No doubt there have been many cases during shipping strike troubles at our large ports when considerable time and expense might have been saved to shipowners and merchants by the diverting of vessels from one port to another.

*Cargo Set complete.*

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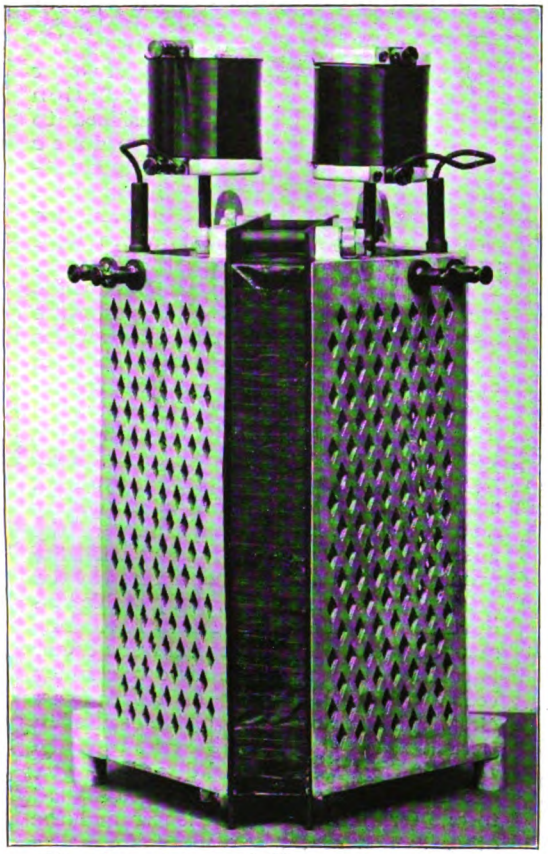
had it been possible to communicate with the vessels in time. This would apply more particularly to the cargo liner and the tramp steamer. Take as an instance the situation in Liverpool last August. Owing to the labour troubles at that port there was no possibility of vessels getting discharged for some time. Those which were carrying perishable cargo might have had a chance of being discharged in some other port, so that there would certainly



*Transformer, ½ k.w. with Choke Coils mounted on top.*

be a great advantage and saving of money if those vessels could have been communicated with by wireless on their approaching the Channel, and instructions given to the captains to proceed to another port. Let us also consider the case of a vessel carrying a cargo of wheat. The cargo may change hands several times between the departure of the vessel from the United States and its arrival at the port of destination in this country. It eventually might be better for the vessel to put in, say, at Cardiff instead of at Hull, or *vice versa*; but an alteration in the course is only possible if the owners are enabled to communicate with the commander by means of wireless telegraphy.

These are only two striking instances of the great commercial advantages of equipping cargo boats with wireless telegraphy. With regard to humanitarian considerations, it is scarcely necessary to emphasise these in view of recent happenings, but it might be as well to recall certain instances where either life or property, or both, lost at sea might have been saved had the vessels which met with disaster been equipped with wireless apparatus.

In the case of the "Loodiana," this ship was overdue for a considerable period, and absolutely no knowledge of her whereabouts was obtainable. Had the vessel been fitted with wireless, there is no doubt that some communication would have been received, thereby informing the world at large what had happened to her. Not so long ago the new ship "Abhona" left the builders' hands at Glasgow a fine ship fitted with every up-to-date appliance—excepting wireless. The vessel never passed Gibraltar, and it is presumed that she foundered somewhere in the Bay of Biscay, certainly within range of some of the numerous wireless telegraph land or ship stations in the locality. There is also the case of the "Parisiana," which was burnt at sea. It is said that if that vessel had been able to summon assistance during the early part of the conflagration, more men would have been available for extinguishing the fire, and the survivors who landed in boats on either St. Paul's or Amsterdam Islands would have been spared the terrible sufferings they had to endure for many a long day before they were succoured.

The wreck of the "Kurdistan" and the loss of all hands on board, with the exception of two, within a few miles of the Scilly Islands, is still fresh in the memory. From the evidence given at the Board of Trade inquiry it is certainly clear that had timely help been available the ship might have been saved; at any rate, the entire crew would have been rescued, and the survivors would not have had to endure their long and terrible experiences in an open boat had it been possible to summon aid by means of wireless telegraphy. The case of the "St. Leonards" affords another striking instance where wireless telegraphy would have meant the saving of the vessel, but unfortunately, being a cargo steamer, she was not so equipped. This ship lost her propeller in the Atlantic and signalled a French steamer, which was unable to tow her as she carried mails. There were many other ships in the immediate vicinity of the "St. Leonards" which would have been willing and able to tow her to port, but it was impossible to get into

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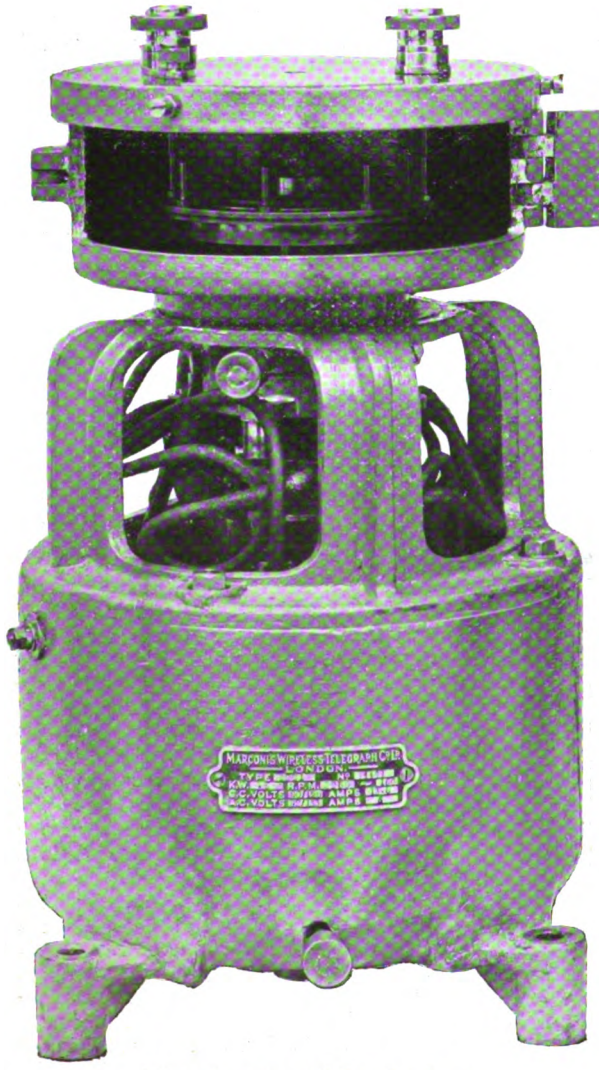
communication with other vessels in the neighbourhood. The "St. Leonards" drifted for a period of twenty days, during the latter part of which she was within 100 miles of the Azores, when she had to be abandoned.

These are only a few examples showing how cargo vessels which have come to grief on the open sea might have been saved had they been equipped with apparatus for wireless telegraphy.




½ *k.w. Converter with Disc Discharger.*

The excuse for not equipping cargo boats earlier, has been the absence of a sufficiently small, compact, and efficient set which would be suitable in cases where the standard ship equipments are too large. The problem of designing such a set has engaged the attention of Marconi's Wireless Telegraph Co., Ltd., who have just evolved a ½-kw. set, which is specially adapted to the requirements of cargo vessels, and in view of the likelihood of the Governments of the world insisting upon the vessels sailing under their flags or entering their ports being equipped with wireless telegraphy it is important to note that a suitable set is now obtainable.

The apparatus referred to is known as the Marconi ½-kw. cargo set. This is a small power installation designed to produce transmitting waves of 250 and 600 meters, or any intermediate wave with a simple change-over from one to any other. The working transmitting range depends upon the height, length and shape of the aerial. The receiving apparatus provides for tuned reception of all waves between 250 and 1,600 meters. The working receiving range is also dependent on the aerial.

The transmitting plant consists of a rotary converter with its starter, field regulator, and guard lamps driven by direct current from the ship's mains and supplying alternating current to the primary of the potential transformer. In series with the primary of this transformer is inserted the low frequency air core, adjustable inductance and the manipulating key. The secondary coil of the potential transformer is connected through two air core choking coils with the primary high frequency circuit. The primary coil of the oscillation transformer is connected in series with the transmitting condenser and disc discharger, one end of the primary coil being connected to one terminal of the condenser and the other to one of the electrodes of the disc discharger. The secondary of the oscillation transformer is connected at one end to an aerial, through an adjustable inductance, and an insulated lead in, passing through the roof or side of the operating cabin. The other end of the secondary connects to the top plate of an arrester earth spark-gap, the bottom plate of the spark-gap being connected to the earth bolts which are fastened to the plates of the iron shell of the ship. The receiving apparatus is connected across the arrester earth spark-gap, an arrangement which enables the receiving operator at a corresponding station to "break in" on the transmission in the event of

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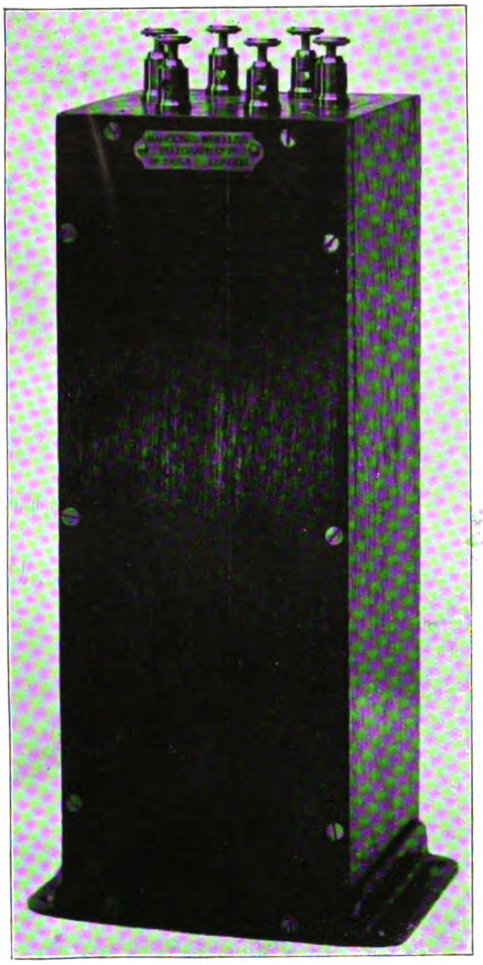
erroneous reception, and thus avoid waste of time.

The rotary converter gives an alternating current output of ½ k.w. It is of the vertical

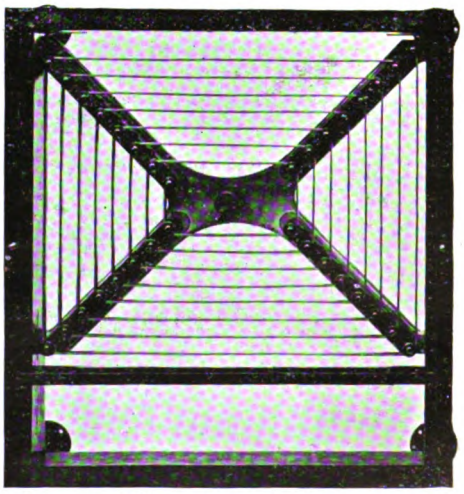


*Low Frequency Inductance.*

type, and occupies a minimum of floor space. The armature is of a special design, and differs from the ordinary converter by giving at the slip rings a constant alternating current voltage independent of the direct current imput voltage. The machine is designed to suit the direct supply available on the ship. It has eight poles, and runs at 2,250 revolutions per minute, thus giving a spark frequency of 300 per second.

The discharger box is made of aluminium, and is fitted on top of the converter, and contains an eight-stud disc, which is carried on the armature shaft by an insulating bush. The top of the box is made of ebonite, and carries the two electrodes. These electrodes are designed to be independently adjusted, and both electrodes can be moved so as to regulate the time of the spark discharge in relation to the alternator. A scale of 180 degrees is fixed on top of the box discharger. The phase displacement is shown by an index mark on the ebonite disc carrying the electrodes. When this index mark is at 0° on the scale, the discharge will take place at the moment of maximum volts on the alternator; at 10° lag. the discharge will take place 10° after the alternator has reached its maximum voltage; and so on. A small fan is fitted on the shaft at the bottom of the box discharger, and this carries away the gases formed by the discharge. The switchboard consists of a black enamelled slate mounted on a cast-iron frame and fitted with an ammeter of the spring controlled type, a double-pull switch, and two single-pull fuses, and is inserted between the alternating current side of the converter and the primary of the potential transformer.

The low frequency primary inductance consists of several layers of No. 14 D.C.C. copper wire wound on an ebonite tube. Tappings are made at various points, and connections made to the terminals mounted on the top of the box. The function of the low frequency



*Primary of Transmitting Jigger showing bare Strip Winding.*

primary inductance is to regulate the power and assist in tuning the circuit.

The low frequency potential transformer consists of a primary and secondary mounted on a closed laminated iron core, the complete trans-

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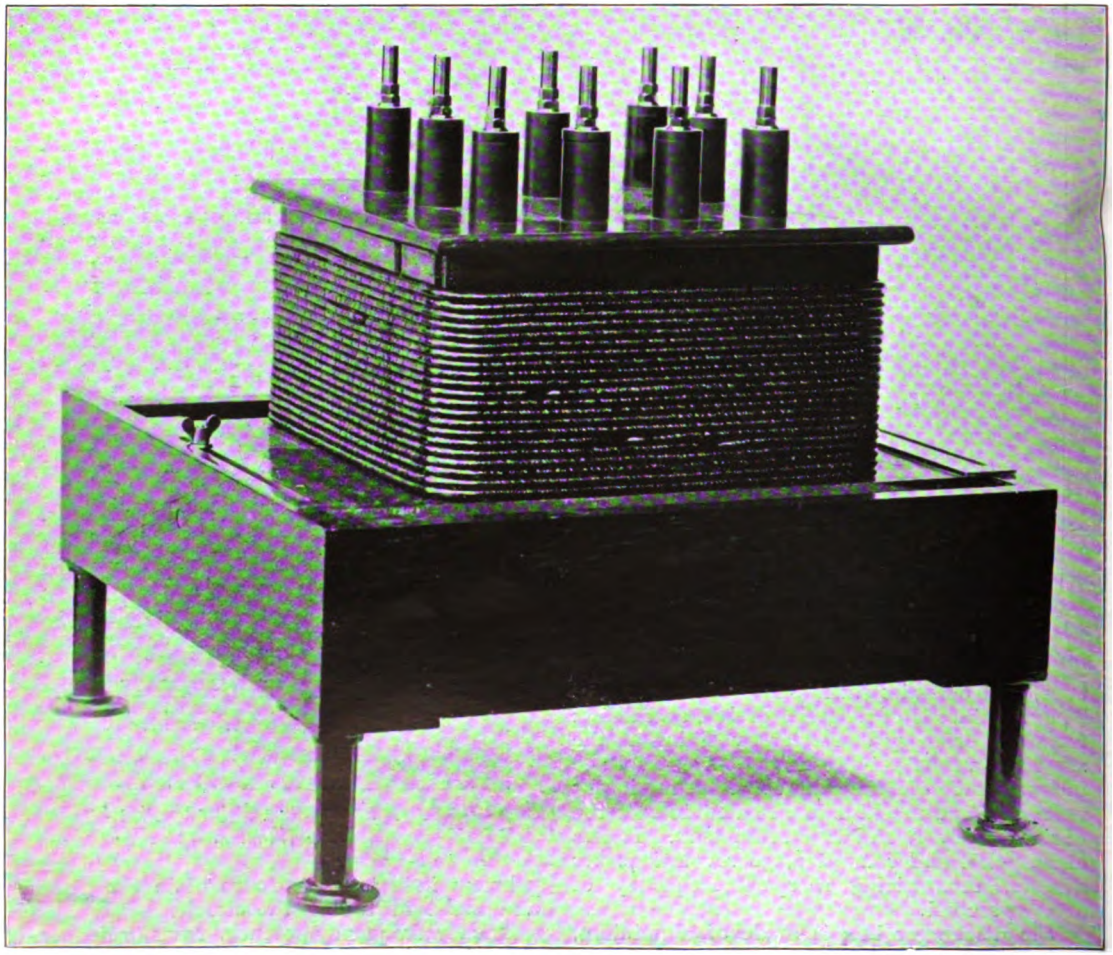
former being enclosed in an aluminium frame. Being of the vertical type, it requires a very small amount of floor space. The ratio is about 95 to 1. The high frequency and air-core chokes consist of a number of turns of enamelled wire wound on porcelain bobbins and mounted on top of the potential transformer. They are inserted in the high tension circuit to prevent any rush of high frequency current into the transformer secondary.

The variable coupling oscillation transformer is of the air-core type, a sheet of ebonite $\frac{1}{8}$ inch thick separating the primary coil from the secondary. The primary consists of about seven turns of copper strip mounted on ebonite ; the secondary consists of twenty turns of stranded copper wire wound on a wooden former about 12 inches square. This secondary coil slides over the primary coil, and by this means a coupling between the wave-generating and the wave-radiating circuit is varied. Connection to the primary is made by means of easily detachable spring clips, which provide a ready method of altering the wave-length. The transmitting condenser consists of 34 glass plates interspaced with 17 zinc sheets, the whole supported in a galvanised iron cradle. The alternate zinc sheets are connected together, thus forming two sections. Each section is connected to an insulated terminal on top of the teak, lead-lined container.

The two protecting lamps supplied are of the single straight filament carbon type suitable for the voltage of the converter, and mounted between spring clips on a board. One lamp is connected as a shunt to the armature, and the other to the field of the converter. These lamps protect the converter from the



*Transmitting Jigger complete.*

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injurious effects of any high frequency currents which may be generated in the primary circuit by providing an alternative non-inductive path for them across the machine. The manipulating key is designed for fast sending, and is fitted with a side lever, which provides a ready method at the hand of the operator for breaking the primary circuit in an emergency. There are three terminals, which have their connections marked on them. In addition, there are two other terminals, which connect to the telephone terminals of the magnetic detector. These are mounted on the end of two insulated spring clips carrying contacts. The contacts touch when the key is depressed, and so short-circuit the telephone and prevent it responding to impulses from the transmitting plant. The receiving circuit is always connected to the aerial, so that when the key is up signals can at once be received, and the operator interrupted in the middle of the message if necessary. The front and back upper contacts of the key and the upper telephone short-circuiting contact are adjustable. The transmitting gear, with the exception of the oscillating transformer, the starter, the regulator, and manipulating key, are enclosed in a sound-proof cabinet. The complete transmitting apparatus is mounted on a wooden base, which slides into the cabinet and provides an easy and efficient means for inspection and repairs.

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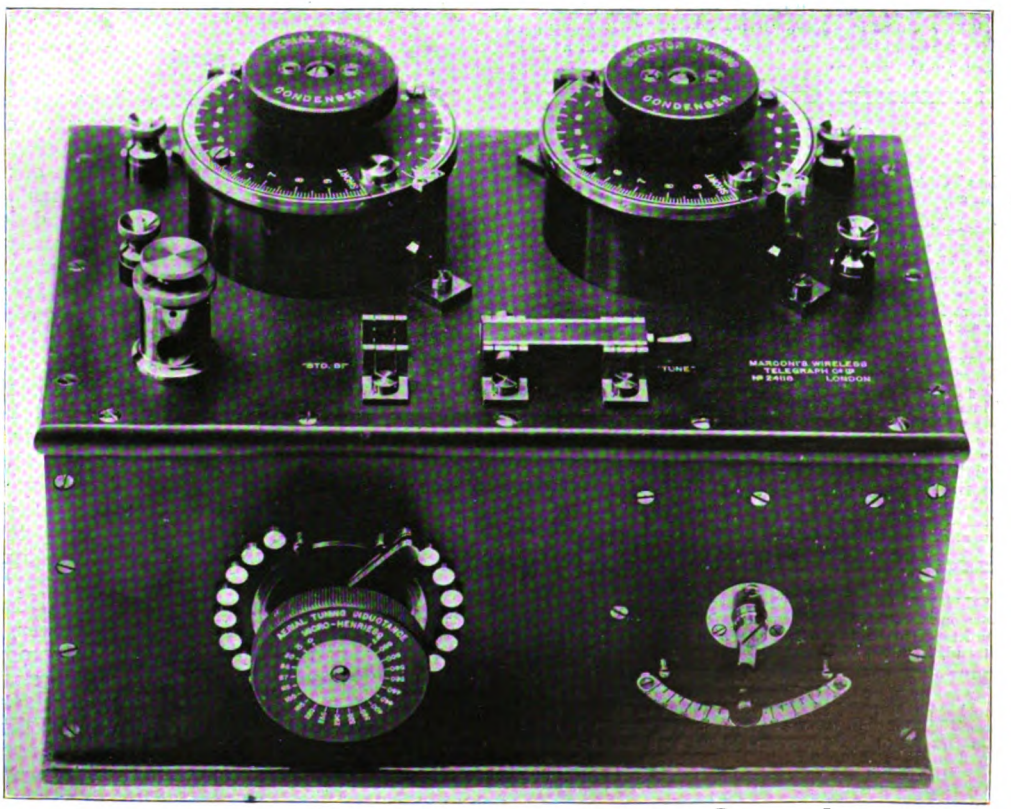
In order to maintain communication with the Mawson expedition to the Antarctic regions, arrangements are being made for the erection of an intermediate wireless station on Macquarie Island, 600 miles south of Hobart.

✦

In accordance with the proposals of M. Millerand, Minister of War, the Army Committee of the French Chamber has drawn up a scheme for the organisation of a military telegraphy service. A regiment of 12 companies, each company consisting of 112 men, is to be stationed in Paris, with the addition of 220 engineers for wireless telegraphy. In North Africa provision is made for two companies of ordinary telegraphists and one of wireless.




*Multiple Tuner for ½ k.w. Set.*

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The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

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**BINDING CASES** for "The Marconigraph," Vol. I., are now on sale, price 1/6 each post free. Applications with remittance to be made to The Publisher, Marconi House, Strand, London, W.C.

**PORTRAIT OF MR. PHILLIPS.** The Publisher begs to announce that he has arranged to supply portraits of the heroic Marconi Officer who lost his life as a result of the "Titanic" disaster at the following prices: Cabinet size, 1/9 each; Enlargements, 10 in. by 8 in., 13/-; 12 in. by 10 in., 14/-; 15 in. by 12 in., 17/6 post free. The portrait is by Miss J. Stedman of Farncombe, and is the same as that from which the illustration in the May number of THE MARCONIGRAPH was made.

### The Share Market

Since our last issue attention in the Industrial section has again been chiefly given to the shares of the various Marconi Companies. Some severe fluctuations have taken place during the last month, brought about by over-speculation in various Industrial shares, in which the shares of the Marconi issues suffered severely. The ordinary shares fell at one time as low as 5 on the severe liquidation of weak accounts and the failure of several brokers, which caused more stock to be thrown on a very sensitive market. The result of this severe liquidation combined with the continued public demand from the small investors has left the market in a much healthier position. Some of the large blocks of American shares which were purchased at their introduction on the London market were realised by weak holders and have passed into the hands of investors, who will no doubt at no distant period be pleased at the bargains they have secured. The prices on May 25th were: Ordinary, 5⅞; Preference, 5⅛; New, 3½; Canadian, 24½; Spanish, 1¼; American, 1⅞.

### An Appeal

On the two occasions when we have appealed to telegraph operators and engineers to contribute towards a fund for the benefit of those dependent upon one of their colleagues cut off from life at an early age, the response has been gratifying in the extreme. It is our sad duty to make a further call upon the generosity of those employed in the service on behalf of a most deserving case. As announced in our obituary columns, Mr. R. O'Driscoll, who was the operator in charge of the high-power Transatlantic station at Clifden, passed away at the comparatively early age of 35, leaving behind him a widow and three young children totally unprovided for. His end came with tragic suddenness, for before entering the Galway Hospital the deceased appeared to enjoy the best of health. Perhaps his genial and generous character helped to conceal even from those nearest to him the approach of his fatal illness; at all events, his death was totally unexpected. In appealing for help for those who have suddenly been bereft of their breadwinner, we feel that we can rely upon a generous response from our thousands of readers of all classes scattered over the whole of the globe. Contributions should be sent to the Editor, THE MARCONIGRAPH, Marconi House, Strand, London, W.C., and all amounts received will be acknowledged in these columns in due course.

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## Honouring the Memory of Mr. Phillips

NUMEROUS expressions of sympathy have been received by the parents and relatives of the late Mr. Phillips, the heroic Marconi operator on board the "Titanic." The following are extracts from some of the letters and telegrams which have reached us:

"The Electro-Technical section of the Imperial Russian Technical Society begs to transmit to the family of Mr. Phillips, the heroic wireless operator, their heartiest sympathy and their deepest admiration for his brave deed.—(Signed) N. POPOPOW."

The London section of the Postal Telegraph Clerks Association passed the following resolution:

"That the London Branch of the Postal Telegraph Clerks Association expresses its admiration of the splendid conduct displayed by the wireless operators engaged upon the ill-fated 'Titanic,' and also expresses deep sympathy with the relatives and friends of the late Mr. Phillips."

The Union of German Wireless Telegraph Operators sent the following to the Marconi Company:

"The Union of German Wireless Operators begs to bring its sincerest condolence on result of the death of Mr. Phillips in fulfilment of his duty, and request your company to inform us whether Mr. Phillips was married or single."

The Danish Telegraph Union of Copenhagen sent the following:

"The Committee of the Danish Telegraph Union beg to express their sincerest condolences with the relatives of the late Mr. Phillips, the first Marconi officer on board the 'Titanic,' and they wish to express their admiration for the heroism displayed by Mr. Phillips, and their delight and pride to number such a man among their colleagues.—(Signed) F. C. MOLLER."

Señor Sagasta, the Director-General of Posts and Telegraphs of Spain, has, in the name of the whole of the telegraph staff of the country, addressed to the International Bureau at Berne an offer to co-operate with other countries in steps to be taken "to perpetuate the memory of the operator Phillips who met a noble death in the fulfilment of his duty." Our contemporary, the *Telegrafista Espanol*, of Madrid, heartily applauds the action of Señor Sagasta, and announces that the Spanish telegraphists have decided to honour the memory of their valorous fellow-operator by placing an enlarged portrait of Mr. Phillips in the instrument room of the central Post Office in Madrid.

## Company Meetings

### Spanish and General Wireless Trust

THE statutory meeting of the Spanish and General Wireless Trust, Ltd., was held on May 9th at the Whitehall Rooms, Hôtel Métropole, Mr. Godfrey Charles Isaacs, the managing director, presiding.

The report of the directors showed that the total number of shares allotted was 249,007, of which 247,000 shares had been allotted as fully paid up in consideration of 12,350 Bearer shares of 500 pesetas each in La Compañia Nacional de Telegrafia sin Hilos, and the remaining 2,007 shares had been allotted for cash and were fully paid up. The receipts and payments of the company on capital account to April 25th, 1912, were as follows: Receipts—£1 per share paid on 2,007 shares of £1 each, £2,007; transfer fees and other receipts, £90 8s; total, £2,097 8s. Payments—Preliminary expenses, £918; sundry expenses, £37 2s. 9d.; cash in hand, £1 8s. 7d.; cash at bankers, £1,140 16s. 8d.

The Chairman said: Gentlemen,—This is a statutory meeting held in compliance with section 65 of the Companies Consolidation Act of 1908, the object of which is to furnish you with full particulars of the financial position of the company, and the report of the directors which has been sent to you complies fully with the requirements of that Act.

From that report shareholders will have learned that of the 249,007 shares allotted 247,000 have been allotted in payment of 12,350 Bearer shares of 500 pesetas each in La Compañia Nacional de Telegrafia sin Hilos. That is the extent of the company's business transactions to date. I make this statement because there have been a number of unauthorised rumours and reports as to other important business which the company was transacting, and I would ask shareholders to pay no heed whatsoever to any rumours or unauthorised statements, but that they should rely confidently upon the company always giving them at the earliest possible moment official intimation of anything which may be of importance to them, whether it be favourable or unfavourable, and if it be not in the form of a circular it will be by an authorised statement in the Press. This applies not only to this company, but to all those companies with which the name of Marconi is associated. I have nothing more to add now in respect of this company's business, except that there is a probability in the near future of the directors considering the increase of the company's capital with a view to their holding shares in certain other of the companies in which the parent Marconi Company has large interests.

The shareholders, however, would like to

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know something of the business of the Compañia Nacional de Telegrafia sin Hilos, in which this company has so large a shareholding. The Compañia Nacional de Telegrafia sin Hilos was formed in Spain under Spanish laws in December, 1910. Its object was to secure the Marconi rights for Spain and Spanish colonies, and to erect a number of high-power and ship stations under a concession which it had secured from the Spanish Government. A contract was entered into between La Compañia Nacional de Telegrafia sin Hilos and the Marconi Wireless Telegraph Company for the erection of these stations. The first of them were erected in Teneriffe and Las Palmas, in the Canary Islands, Cadiz, Vigo, Barcelona, and Soller, on the Island of Majorca. The last was completed at Aranjuez (Madrid), and its opening was inaugurated by the King of Spain.

All these stations are now at work communicating between the shore and ships at sea, and are ready for the conduct of an international telegraph service. A considerable business is being done between Spain and the Canary Islands; the cable system having broken down, the wireless telegraph stations are conducting the whole service. So soon as the war in Tripoli will be at an end arrangements will be made to open up the service between Spain and Italy, and ere long it is contemplated that the necessary arrangements will be completed for a service to be conducted between England, Spain, and the Canary Islands. This will also, of course, involve a service from the Canary Islands and Spain to the United States of America and Canada through England. This telegraph business will require a little while to develop and assume its full importance. There are additional stations to be erected, but inasmuch as negotiations with the Spanish Government are now pending as to the location of the stations, I am not able to say more upon that subject. With the general development, however, of Marconi stations in all parts of the world, so will the traffic of the Spanish stations increase, and the importance generally of the business of the Compañia Nacional de Telegrafia sin Hilos will be the better understood and, I think, appreciated. It is, in my opinion, destined to play a very important part in the network of stations which will be owned or controlled by the Marconi companies, or in which the Marconi companies will be interested.

**The French Company's Successful Year**

The annual meeting of the Compagnie Française Maritime and Coloniale de Telegraphie sans Fil (the French Marconi Company) was held in Paris on May 11th. The capital of the company is 100,000 frs. The receipts during the year amounted to 140,864.70 frs., from which was deducted the sum of 125,422.54 frs., representing gross expenditure, leaving a net balance of 15,442.16 frs. The total cash resources of the company at the end of 1911 amounted to 42,380.15 frs., which represented a decrease compared with the preceding year, due to the fact that last year eighteen new wireless telegraph stations were established out of the company's resources, and that the equipment of the works in which the apparatus is made was increased and brought thoroughly up to date. The apparatus at some of the company's stations was also improved during the year, and the directors have determined to continue their policy of modifying the equipment of stations wherever this may be found necessary.

It is pointed out in the report that an important agreement was concluded between the French authorities and the company on April 14th, 1911, the result of which has proved entirely satisfactory, and has consolidated the good relations between authorities and the company. As a result of an official visit to the works of the company by representatives from public departments, the company were invited to take part in the adjudications of the different departments for the provision of wireless apparatus. Another important event which took place during the past year was the installation of two stations at the Aviation Exhibition, held at the Grand Palais. This exhibition enabled the company to demonstrate the superiority of their apparatus, and resulted in some important orders from the State. Statistics furnished in the report denote a gratifying increase in the traffic handled by the company; huge increases are shown in the number of messages handed in on board ship, in the messages received at the company's offices for transmission to ships at sea, and in the number of marconigrams sent *via* Clifden to North America, the latter representing an increase of more than 500 per cent. The allocation of the profits of the past year was as follows: 5 per cent. to reserve and a dividend of 5 frs. per share (free from taxation), the sum of 9,670.06 frs. being carried forward. The retiring directors, MM. Musnier and dal Piaz, were re-elected.

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Among the features of the Boys' Naval Brigade's Review, held recently, was a display of wireless telegraphy.

When the King paid a visit to the Fleet an elaborate naval aviation programme had been arranged. In view of the condition of the weather, the Admiral Commanding the Fleet ordered that no flying was to be attempted. This order was communicated to the aviators by means of a wireless message received from H.M.S. "Neptune" at the temporary wireless station on the Lodmore aviation ground.

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# Mr. Marconi on Future Developments

MR. MARCONI arrived at Plymouth on May 6th from America, and was immediately besieged by Press representatives with requests for an interview. The interval between Mr. Marconi's departure for and arrival from America has been an epoch-making one, and it is but natural to expect that there would be a great desire to obtain Mr. Marconi's views upon the important events that have taken place. The following is a report of the interview which appeared in the London *Evening Standard* :—

Within the next twelve months it will be possible to send a wireless telegram direct from London to New York without the assistance of the Post Office land lines, as at present. In a little longer period a wireless message can be flashed round the globe through all-British wireless stations.

These and other interesting facts concerning the future developments of wireless telegraphy were mentioned to one of our representatives to-day by Mr. Marconi, the world-famous inventor of radio-telegraphy, who reached London this morning from New York, where he gave most important evidence before the "Titanic" Commission.

Mr. Marconi is full of confidence as to the outcome of his big schemes for encircling the globe with a great system of wireless. "Wireless," he said to-day, "is progressing all the time, and extending its reign in all directions. We are proposing to erect very soon big stations for communicating direct between England and America, or, rather, between the vicinity of London and the vicinity of New York.

"I hope this service will be in operation within twelve months, although we have not yet fixed on the location of the stations. The messages will go through within a very few minutes, practically instantaneously ; time is at present occupied in transmitting the messages to Clifden, and repeating them on the other side from Glace Bay to New York. By our arrangement with the Western Union on the other side the messages will be delivered as quickly as any cablegram.

"This will constitute the longest regular wireless service in the world, but we have

*Gold Tablet, modelled by the celebrated Sculptor, Prince Paul Troubetzkoy. Presented to Mr. Marconi by prominent Citizens in New York.*

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sent messages over greater distances, as, for example, from Ireland to Buenos Ayres, a distance of nearly 7,000 miles."

Mr. Marconi went on to discuss the world wireless scheme, all the stations for which will be on British territory. "I shall soon have a great deal to do with this scheme in designing the stations," he said. "The exact number to be erected depends on the intentions of the Government, and has not yet been decided. But when this decision has been reached, we shall begin the simultaneous construction of all the stations, and they ought to be completed within twelve months.

"The Government will have the direction of all these stations, and will pay us £60,000 per station, exclusive of the cost of buildings and foundations."

The conversation naturally turned to the lessons to be derived from the "Titanic" disaster. "It shows," said Mr. Marconi, "the great benefit of wireless telegraphy, and also that it is desirable to have two operators on all ships carrying the system. Further, it proves that some regulation of wireless telegraphy in America is imperatively necessary.

"No false news or false messages of any kind emanated from any Marconi station. That was established by the official inquiry and by the inquiries we ourselves made. So far as the Marconi Company is concerned there was no keeping back of news, as has been alleged. We would not attempt to do anything of the kind; neither should we have the power to do so.

"Much has been written," said Mr. Marconi, "regarding the tapping of messages. No tapping is possible when you are communicating between shore stations; but nearly all ships are 'tuned' alike, and necessarily so. Under the Berlin Convention every ship speaks purposely in practically the same 'tune,' so that any call at sea is received by any ship within the range of the sender.

"Otherwise vessels would never be able to receive signals of distress. The intention is not that there should be secrecy at sea, but, on the contrary, there is a law which provides that every ship should speak in a certain 'tune.'

"I do not think," added Mr. Marconi, "that anything has the more demonstrated the necessity for wireless being compulsory on all ships than has this disaster. There cannot be the slightest doubt that there are twenty times as many tramp steamers as liners crossing the Atlantic, and we know that there was one steamer in close proximity to the 'Titanic' when she struck. Had this steamer had wireless, the story of the 'Titanic' disaster would have been very different."

Mr. Marconi indicated that he was further perfecting wireless apparatus, notably in the direction of discovering the bearings of ships in fog. This would facilitate the finding of any ship in difficulties.

Before leaving New York a committee of prominent New Yorkers presented Mr. Marconi with a gold tablet engraved with his portrait, in commemoration of the part which wireless telegraphy played in the disaster. The modelling on the tablet is the work of Prince Paul Troubetzkoy.

## Clearing the Air

It has been incorrectly reported that the Boston Circuit Court of Appeals is preventing the sale of the United Wireless Company to the Marconi Company owing to the latter company's infringement suit against the former company's property. The fact is that the Boston Court has merely decided that the trustees in bankruptcy should defer for the present the actual transfer of the title, but this will not affect the sale to the Marconi Company nor interfere with the ordinary conduct of business by that company.

Proceedings have been instituted by the Marconi Company against a firm of members of the London Stock Exchange for libel in respect of statements contained in a recent weekly report.

At a recent meeting of the Battersea Polytechnic Engineering Society, Mr. A. Smith read a paper on wireless telegraphy. Mr. Ashton took the chair. The following account of this lecture appears in the interesting magazine of the Polytechnic :—"Mr. Smith dealt with the development of the Marconi system of wireless telegraphy. He explained in detail the action of the discharge of condensers and the propagation of waves undischarged, and illustrated his explanation by slides showing the propagation from a Hertz oscillator, and by some interesting mechanical analogies. He next dealt with the first simple transmitting apparatus used by Mr. Marconi, afterwards with the famous patent, whereby the inductive coupling of aerial and condenser circuit makes commercial communication possible for very long distances. Mr. Smith concluded his lecture by an expression of thanks to Marconi's Wireless Telegraph Co., who had lent him a magnificent set of slides."

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A MATTER of the utmost importance to the shipping interests is the transfer of the ship and shore stations formerly owned or worked by the United Wireless Company to Marconi's Wireless Telegraph Company of America in accordance with the judgment of the United States Court. It is well within the recollection of our readers that the Marconi Company succeeded in their action against the United Wireless Company for infringement of their American Patent, corresponding to the well-known English Patent No. 7777 of 1900, and the defending company not only acknowledged the validity and scope of the patent and admitted their infringement, but submitted to judgment and a permanent injunction in favour of the Marconi Company. The result of this is that 500 ship stations and about 70 land stations which had been erected and worked by the United Wireless Company passed into the hands of the Marconi Company. It is not difficult to conceive the great advantage of this arrangement, whereby the points for intercommunication between ship and ship have been so considerably increased and many additional land stations thrown open for traffic with vessels off the American coasts. To give anything like a list of the ships fitted with wireless which have come into the hands of the Marconi Company would occupy too much space, but some indication of the magnitude and importance of the arrangement may be gauged by the mere mention of the important ines affected by the arrangement.

The classes of vessels which are now added to the Marconi organisation comprise passenger, cargo, collier, barges and other craft, and the vessels are owned by such well-known and important shipping companies as the Mallory Line, the Quebec Steamship Company, the Red D Line, the New York and Porto Rico Steamship Company, the Savannah Line, the Panama Railroad Company, the Old Dominion Line, the Standard Oil Company, the Merchants & Miners Transportation Company, the Royal Mail Steam Packet Company, the United Fruit Company, the Wilson Line, the Nelson Line, Lamport Holt & Company, the Lloyd-Brazileiro Steamship Company, the Clyde Line, the Ward Line, the Bank Line (Messrs. Andrew Weir & Co., Ltd.), the Pacific Mail Steamship Company, the Grand Trunk Pacific Coast Steamship Company, the Canadian Pacific Steamship Company, and the Pacific Coast Steamship Company. From the names of the shipping companies which we have extracted from the list, it will be seen that the vessels are owned by most of the leading lines plying between New York and Boston and other ports on the Atlantic and Pacific coasts of America. A good many of the ships are employed in the Great Lake service.

Marconi's Wireless Telegraph Co. have concluded an agreement with the Argentine Navigation Co. (Nicholas Mihanovich & Co., of Buenos Ayres) for the installation of Marconi Standard 1½ k.w. apparatus on board twenty river vessels. The apparatus is of the same type as that supplied to the same company's s.s. " Rawson," which has proved so satisfactory in operation that it has been the forerunner of the large contract just concluded. The fitting of these boats will be completed in time to enable them to comply with the Uruguayan decree, which makes it compulsory for all vessels conveying passengers between Uruguay and foreign ports to have wireless telegraphic installations on board. The vessels will be fitted in Monte Video by the Marconi engineers. The work is in charge of Mr. C. S. Persichetti, who is being assisted by Mr. P. H. Johnson.

The Marconi Wireless Telegraph Company, of Canada have received instructions to equip two vessels, one for the Kingston Shipbuilding Company, of Kingston, Ont., and another for the Collingwood Shipbuilding Company, of Collingwood, Ont. Both steamers are being built for the Marine Department, and are small steamers that are to be employed in the service of supplying the various lights and other aids to navigation around the Canadian coast. The names of the vessels are the s.s. " Estavan " and the s.s. " Dollard."

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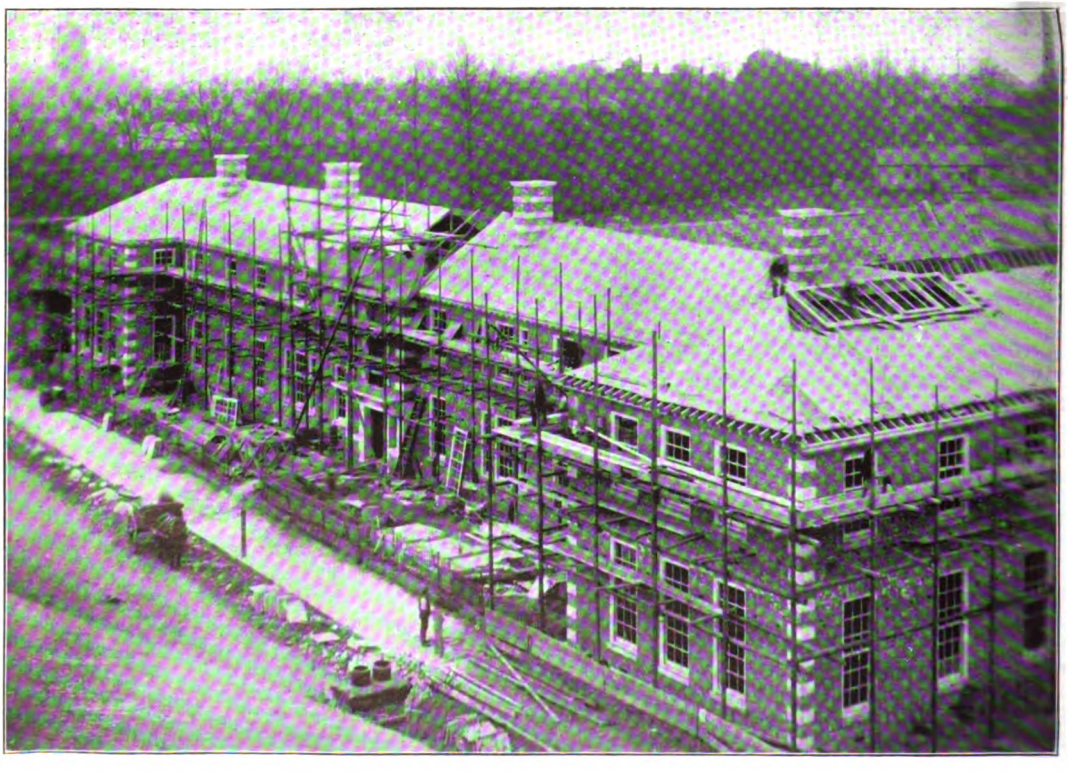
# The New Marconi Works at Chelmsford

THE visitor to Chelmsford cannot fail to have noticed the remarkable progress within a very short time of the erection of the new works for Marconi's Wireless Telegraph Company, Ltd. The buildings are now practically completed, whilst the piping for heating, lighting, and drainage is almost in position. The site faces the Great Eastern Railway Company's main line to Colchester, and a connection therewith is taken across New Street to a double siding which runs along one side of the works for the entire length, a roadway being provided between the two rail tracks. Fronting the street is a two-storied block, comprising several offices, a show-room, a large drawing office, and rooms for other purposes, a special feature being the number of reception rooms found necessary for the firm's numerous visitors. This building is of brick with stone facings and a handsome main entrance ornamented with stone carvings, the dimensions being 200 ft. long by 40 ft. in width. Artificial heating is by low-pressure hot-water radiators. Between the office block and the works building is an instrument test-room of fireproof construction, with a flat concrete roof. The main buildings measure 466 feet in length by 150 ft. in width, and the roof is in 530 ft. spans, having the unglazed portion covered by green slates over felt and matchboarding. The whole of the works are raised to the level of the floor of a railway waggon standing in the sidings, and two rail-loading docks, with the necessary turntables, are provided in the packing department, the siding equipment being completed by two electric capstans and a weighbridge. Next to the sidings are the power test-room and packing department, and the carpenter's shop. Adjoining these are the finished and raw material



*View of the Chelmsford Works in course of Construction.*

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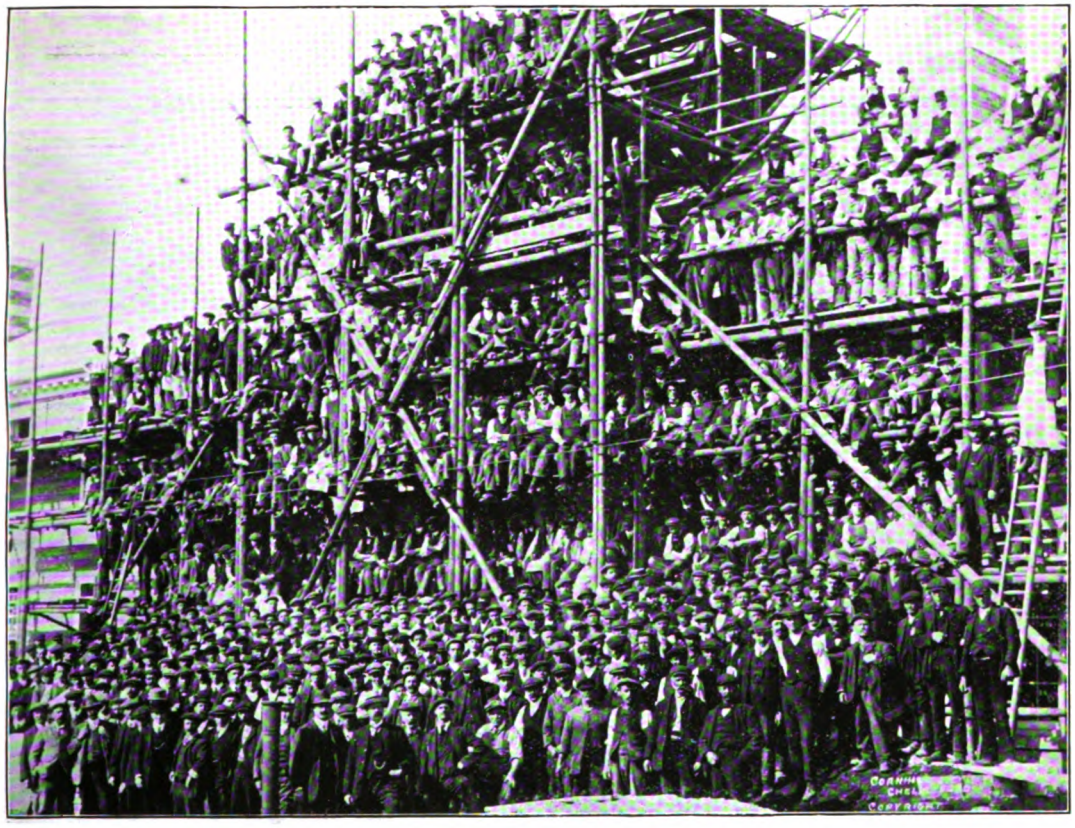

*View of the Men at Work on the New Building.* [Photo by Cornhill.

stores, and a shop for riggers and tinsmiths. The raw material stores communicates with the machine shop, a condenser and winding shop, and the carpenter's shop, through serving windows, while the finished parts store has the power test-room on one side, and the assembling and machine shops on the other. This department is served by a 5-ton three-motor overhead travelling crane, for which the rungways extend over the loading docks and the packing department. On the other side of the room is an assembling shop 90 ft. square, a machine shop 178 ft. by 90 ft., a condenser and winding shop 112 ft. by 90 ft. All the departments are capable of future extensions. A power-house, 73 ft. by 33 ft., is erected on the sidings, together with a circular brick stack 130 ft. in height by 4 ft. 4½ in. diameter inside at the top. A cooling pond for condensing has been dug out next the power-house. Two masts, each 450 ft. in height, with aerials between them, are being erected—one at the works, the other on a separate ground at the requisite distance away. The masts are built up of pressed steel plates having four external flanged vertical joints to the round and angle rings for connecting the sections horizontally, the diameter being 3 ft., and the plates ½ in. thick throughout. There are five sets of insulated stays connected with four steel anchors, the latter being set in 100-ton concrete blocks on a 220 ft. radius, while the central foundation block weighs 120 tons. The works have been erected by Messrs. Cubitt & Co., Ltd., to the designs of the architects, Messrs. Dunn & Watson, and were built in record time, over 500 men being continuously engaged on the work. The ground was picked out on February 10th, and bricklaying only began on the 26th of that month, yet the buildings, floors, and piping are practically complete. The work so far has involved the laying of 2½ million bricks, the erection of 400 tons of steel work, and the carting of 9,000 loads of earth. Within a few days all the machinery and equipment will be in full working order.

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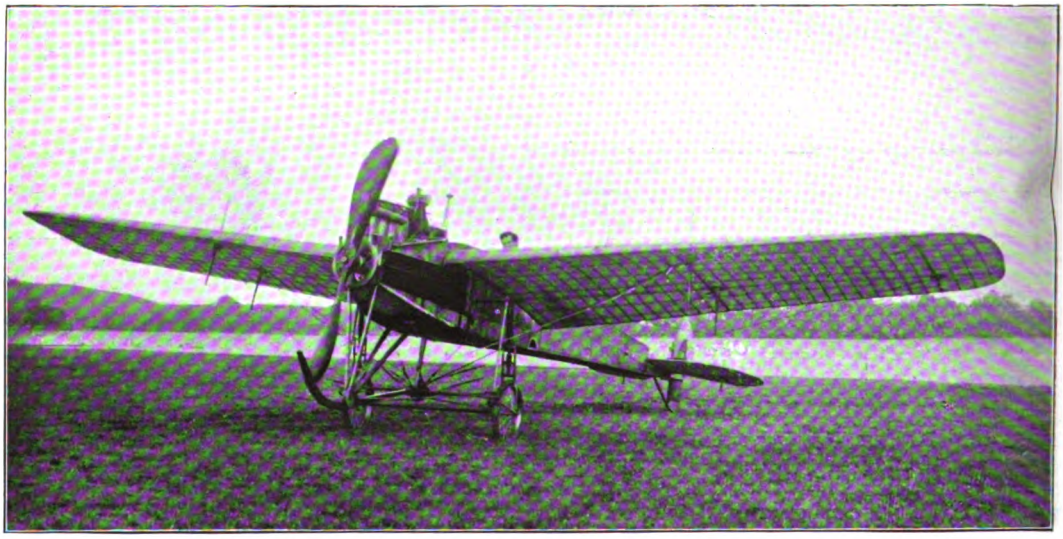
# Wireless for Aeroplanes

## New Marconi Apparatus

WE have already described some experiments conducted with Marconi wireless apparatus on a Flanders monoplane. Since then the apparatus has been transferred from the Royal aircraft factory at Farnborough to Brooklands Aviation Ground, near Weybridge, with a view of carrying out further experiments. Important advances have been made since the earlier experiments were described, and it is now possible to use an aerial wire contained on the machine instead of a trailing wire as formerly. This advantage is an important one, especially from the pilot's point of view, as it enables the aeroplane to fly as near as flying conditions allow it to other machines, and also obviates any trouble which might arise from a trailing wire in the event of a landing being made in a confined space.



*Flanders Monoplane on which experiments with Wireless were carried out.*

The early experiments were devoted almost entirely to the question of transmitting messages from the aeroplane to the ground, and, as previously reported, this has been carried on up to five miles with a small set. Lately, however, the question of receiving messages in the aeroplane sent from a station on the ground has been receiving attention, and a few days ago the first tests were successfully carried out. The chief difficulty was found to be the noise of the engine and propeller of the machine, and the operator suffered some inconvenience from the strong propeller draught.

On May 13th a serious accident occurred which will have the effect of postponing further experiments for some little time. Mr. Fisher, the pilot of the Flanders monoplane, who had been flying for the wireless tests, was carrying a passenger, and whilst turning on his third circuit had a bad sideslip which caused him to fall a considerable distance to the ground. The machine was travelling very fast at the time, and the impact was so strong that the machine was wrecked and Mr. Fisher and his passenger both lost their lives. On the previous day Mr. A. W. Mathieu, the wireless operator, had flown on this monoplane with Mr. Fisher, and had received signals from the Flanders shed continuously during a flight of several miles whilst flying over Weybridge and the country round, and at the time of the accident he was waiting for the machine to alight so that he could take the place of the ill-fated passenger. None of the wireless apparatus was on the machine at the time of the accident. It is hoped that in the next two or three weeks the Flanders Company will have one of their new army type

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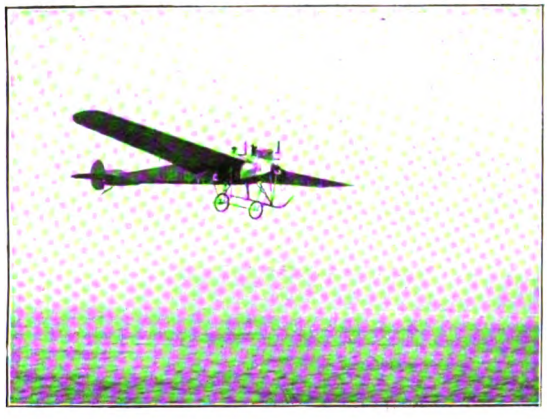
aeroplanes ready on which to finish the wireless experiments which have been twice delayed by accidents, and which have shown the practicability of designing commercial wireless sets capable of being fitted to any type of aeroplane.

The illustration in figure 1 shows the Howard Flanders monoplane on the ground at Brooklands with Mr. Robert Kemp in the pilot seat. The photograph was taken at the time when the first experiments were carried out at Brooklands. Figure 2 shows the machine in the air with the same pilot.



*Flanders Monoplane Flying.*

We are now able to give some particulars of the Marconi aeroplane set, which has been made adaptable as far as possible to any type of aeroplane. This set has been made up into several separately contained units, with the idea of having as wide a margin as possible for the distribution of weight, which is a consideration of great importance for every type of air craft. The apparatus is very strongly constructed, and has stood very severe treatment without in any way suffering from it. The source of supply can be either primary or secondary batteries, and if the latter type is adopted, a special unspillable accumulator case is supplied, from which there is no fear of acid splashing out and damaging the machine in the event of a rough landing or a fall. The only high tension wire on the machine is run in a very well insulated tube through the fusilage of the machine, which makes the pilot and passengers absolutely immune from any chance of a shock whilst the apparatus is working. The trailing wire aerial is fitted with a safety plug, which is adjusted to stand only as much strain as it would be subjected to when the machine is flying, and which frees itself immediately in the event of the wire having any extra strain put upon it, such as would occur if it came into contact with trees or anything during a flight. It has been found convenient for the bulk of the apparatus to be fitted underneath the pilot and passenger seats, and it has therefore been designed with a view of placing it upside down or in any other position most suitable to the type of machine on which it is to work.

The only part of the apparatus which need be exposed is the manipulating key and the small control switch, and these can be placed in any position most suitable to the pilot or passenger who is to carry out the work of observing and reporting.

The receiving station is very compact, and is fitted with a portable mast, which can be erected in a very few minutes.

The wave length of the set is comparatively short, and consequently the receiving apparatus is not in any way troubled by interference with other stations, and very little adjustment is required in tuning.

Beyond its uses from a military point of view, a machine thus equipped enables the pilot to keep in constant communication with the aerodrome or headquarters during a flight, which in cross-country and long-distance flights would be of great importance.

## Aid by Wireless

There is a happier side to the story of starvation on St. Kilda. Mr. Winston Churchill happened to be in town on Saturday, the 28th May, when the news arrived, and, realising the gravity of the situation, he acted promptly on the information. Proceeding at once to the Admiralty, the First Lord sent a wireless message to the Commander-in-Chief of the Home Fleet, who is cruising around the West of Scotland just now, instructing the immediate despatch of a cruiser to supply the starving islanders with provisions.

The result of this promptitude was seen in the following official statement issued from the Admiralty :

> The Secretary of the Admiralty begs to state that H.M.S. " Achilles " was yesterday ordered to visit St. Kilda, and arrived at the island early this (Sunday) morning.

The Admiralty statement does not mention in what way Mr. Churchill's instructions reached the " Achilles," but in all probability it was received by the Commander-in-Chief at Lamlash on the island of Arran in the Forth of Clyde, and by him transmitted to one of the cruisers further down the Firth in the neighbourhood of Culov Craig. About two years ago the Admiralty had to render help in similar circumstances.

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# The "Titanic" Inquiry

THE sittings of the Court of Inquiry appointed by the Government to investigate and report upon the loss of the "Titanic" are now being held, with Lord Mersey as President. They opened on May 2nd, and the Attorney-General (Sir Rufus Isaacs, K.C., M.P.), who is leading counsel for the Board of Trade, read to the Court at its first sitting a list of the questions which it was proposed to submit. One of the questions to be submitted was :

> What installations for receiving and transmitting messages by wireless telegraphy were on board the "Titanic"? How many operators were employed in working such installations? Were the installations in good and effective working order, and were the number of operators sufficient to enable messages to be received and transmitted continuously by day and night?

There is no need to deal here with the general evidence and the intricate mass of detail which is being unravelled at almost every step. It will suffice to confine ourselves to the evidence bearing upon the working of the wireless, which has been compiled for this journal from reports in *The Times* and other newspapers, The Marconi Company are in no way responsible for any of the statements made.

Here, as we have been reminded again and again, for hours together were ships ploughing the ocean hundreds or thousands of miles from land, and, for that matter, hundreds of miles from each other, advising one another, as if in the most customary, every-day way, of the presence of ice in the North Atlantic—passing the word, so to speak, from mouth to mouth.

Mr. Cyril Evans, examined by the Solicitor-General on May 15th, stated that he was the sole Marconi operator in the "Californian." At 5.35 p.m. New York time, or 7.30 ship's time, he received a message from the steamship "Antillian" that an hour before she had seen three large icebergs to the southward. A little later he heard from the "Titanic" and offered her the report about the ice, and she replied, "All right, I heard the same thing from the 'Antillian.'" At 9.5 New York time, or 11 o'clock ship's time, the captain directed him to tell the "Titanic" that the "Californian" was stopped and surrounded by ice. He sent the message to the "Titanic" and got the reply, "Keep out." That was because the "Titanic" was at that moment in communication with Cape Race, and his message had caused an interruption. The "Titanic," however, must have heard what he had said about the ice, because his signals were much stronger and louder than the Cape Race signals. He next heard the "Titanic" say to Cape Race, "Sorry, please repeat." The messages from the "Titanic" to Cape Race were private messages from the passengers.

The witness was then examined in regard to the visit paid to his room by Mr. Stewart, the chief officer, at ten minutes to 6 o'clock ship's time. Mr. Stewart said to him, "There's a ship been firing rockets; will you please try to find out whether there is anything the matter?" The witness immediately jumped out of his bunk and took up the telephones, but he could hear nothing. He then sent out a general call, and got an answer from the "Mount Temple" saying, "Do you know the 'Titanic' struck an iceberg and is sunk?" The "Frankfurt" also sent him the same message. At this time Mr. Stewart was in the room. When he heard the messages from the "Mount Temple" and the "Frankfurt" he wrote down the position on a piece of paper and gave it to the captain. Then he asked the Allan liner "Virginian," which was coming from Cape Race, for an official message, and she gave it as follows: "'Titanic' struck berg, wants assistance, urgent, passengers in boats, ship sinking. Position 41.46 N., 50.14 W. Gamble, Commander."

In cross-examination witness said he judged by the strength of the "Titanic's" signals that she was not more than 100 miles away from the "Californian" in the afternoon. They had instructions to communicate with all ships in cases of distress.

Captain Henry Moore, master of the Canadian Pacific Railway steamer "Mount Temple," 6,661 tons, was the next witness. He described the receiving of the "Titanic's" "C.Q.D." message on the morning of April 15th, and how he immediately put the ship round and steered east.

Mr. John Durrant, Marconi operator of the "Mount Temple," was the next witness. In reply to the Solicitor-General, he stated that the range of his wireless installation was 150 miles by day and 200 miles by night. On the evening of Saturday, April 13th—the day before the foundering of the "Titanic"—he got an official message from the captain of the

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" Corinthian " to the captain of the " Mount Temple " that ice had been seen. This was the only message he received in regard to ice before the wreck.

The witness then proceeded to give from his log-book the various calls he heard sent out by the " Titanic " and the replies to them by ships which they reached.

The first thing he heard of the " Titanic " was at 11 minutes past 12 o'clock (ship's time) on Sunday night, when he got the message " C.Q.D." from the " Titanic," giving her position, and adding, " Come at once. Struck berg. Advise captain." He told his captain at once. After the lapse of ten minutes he had the entry, " ' Titanic ' still calling C.Q.D.," that she was asked by the " Carpathia " what was wrong, and replied, " Struck iceberg. Come to our position," which was given. At 12.26 a.m. he made the entry—" ' Titanic ' still calling C.Q.D." At this time the " Mount Temple " had altered her course, and was speeding to the assistance of the " Titanic." This had been done about 15 minutes after getting the first signal. At 12.34 he heard the " Frankfurt " answering the " Titanic," and the " Titanic " giving her position to the " Frankfurt." The " Titanic " asked, " Are you coming to our assistance ? " The " Frankfurt " said, " What is the matter with you ? " and the " Titanic " answered, " Have struck an iceberg. Sinking. Come to our help. Tell captain." The " Frankfurt " then said, " O.K. Will tell bridge at once," and the " Titanic " replied, " O.K. Yes. Quick." At 12.42 he heard the " Titanic " calling " S.O.S."

At a quarter to 1 o'clock he heard the " Titanic " sending out both calls. She then got into touch with the " Caronia," and next with the " Virginian."

The SOLICITOR-GENERAL : If you had broken in and talked to the " Titanic " you would have interrupted her messages to other ships ?—Yes, I never said a word after I got her position. The first rule in wireless telegraphy is " Never interfere."

The witness, continuing the narrative from his log-book, said the " Titanic " called the " Olympic " at 12.43 a.m. The " Olympic " replied at 1.6 a.m., and got the message, " Get your boats ready. Going down fast by the head." At 1.11 the " Frankfurt " sent a message to the " Titanic," " Our captain will go for you." At 1.13 he heard the " Titanic " working the " Baltic."

The witness said the " Titanic " answered the " Olympic," " We are putting the women off in the boats." At 1.29 the " Titanic " sent out a general call, " C.Q.D. Engine-room flooded." The " Titanic " also informed the " Olympic " that the sea was clear and calm. At 1.31 he heard the " Frankfurt " say to the " Titanic," " Are there any boats round you already ? " and to this the " Titanic " made no reply. At 1.33 he heard the " Olympic " send a message to the " Titanic," asking whether the " Titanic " was steering south to meet the " Olympic," and the reply of the " Titanic " was simply the code word for " Received." That was the last message that he heard from the " Titanic." The messages from the " Titanic " did not get fainter towards the end. When the messages ceased, he thought the flooding of the engine-room had put the wireless out of condition. Most ships, including his own, carried storage batteries for use when power could not be obtained from the dynamos, and the wireless apparatus could be changed from the dynamos to the storage batteries in a minute ; but the range of a wireless using storage batteries would be less than that of a wireless using dynamos.

At 1.41 a.m. he heard the " Frankfurt " and the Russian ship, the " Birma," calling the " Titanic," and there was no reply. At 1.56 the " Olympic," the " Frankfurt," and the " Baltic " called, and again there was no answer from the " Titanic." At 2.11 the " Birma " informed the " Frankfurt " that she was 70 miles from the " Titanic." At 2.36 he made the entry, " All quiet now. The ' Titanic ' has not spoken since 1.33." At 3.11 he heard the " Carpathia " say, " If you are there, we are firing rockets." At 3.26 the " Carpathia " again called the " Titanic." At 3.44 the " Birma " told the " Frankfurt " that he thought he heard the " Titanic," and calling her, said, " Steaming full speed to you. Shall arrive 6 in the morning. Hope you are safe. We are only 50 miles away." At 3.46 he heard the " Carpathia " calling again. At 4.46 he made the entry, " All quiet. We are stopped away. Pack ice." At 5.11 the " Californian " called, " C.Q.," and he answered, telling her that the " Titanic " had struck an iceberg and sunk, and he gave her the position. At 5.26 he heard the " Californian " speaking to the Frankfurt," and the " Frankfurt " replied to the same effect. His last entry was, " 8 a.m. Heard from ' Carpathia ' that she had rescued 20 boatloads."

Witness denied that he heard any message to the effect that the " Titanic " was steaming to Halifax, or that all passengers had been rescued.

Captain James Barr, of the " Caronia," was on May 17th examined in relation to a warning as to ice which he sent to the " Titanic " at 9 o'clock on the morning of Sunday, April 14th. The marconigram he sent was in the following terms : " West-bound steamers report bergs, growlers and field ice in 42 N. and 49 to 51 W." At 9.45 he received the following reply : " Thanks for message and information. Have had variable weather throughout.—SMITH."

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On May 22nd Mr. G. E. Turnbull, the deputy-manager of the Marconi International Marine Communication Company, was called to prove from the records of "La Touraine," the "Caronia," the "Amerika," the "Baltic," the "Californian" and the "Mesaba" the warning messages which were said to have been sent to the "Titanic."

He explained that the records of wireless messages sent or received by a ship with the Marconi installation were sent to the offices of the company at the end of the voyage. The *procès verbal*, or diary of messages, kept in the Marconi office in the "Caronia" showed that on April 14th Captain Barr sent a warning message as to ice to the "Titanic" at 1.26 p.m. It was acknowledged in the following terms:

"Thanks for information. We have had variable weather throughout.—SMITH."

The wireless message from the German steamer "Amerika" on April 14th reporting that she had passed two large icebergs was intended for the Hydrographic Office at Washington. It happened that at the moment the "Amerika" sent out the message she was not within the range of communication with Cape Race, but she was within the range of communication with the "Titanic," which, in turn, was within the range of communication with Cape Race; and, therefore, the "Amerika" asked the "Titanic" to forward the message to Cape Race. Mr. Turnbull said that he had sent two telegrams to the wireless station at Cape Race asking them to state whether they had received on April 14th a message from the "Amerika" via the "Titanic," and to say whether they got the message direct from the "Titanic" or through another ship. The answer he received was as follows: "Received direct from 'Titanic,' April 14th, steamship 'Amerika,' via 'Titanic.' 'Amerika' passed two large icebergs in 41.27 N., 50.8 W., on April 14th."

The PRESIDENT: That, at present, satisfies me that this message had reached the Marconi operator in the "Titanic," was read by him, and transmitted by him to America. But there it stops.

Witness added that the receipt of the message from the "Amerika" by the "Titanic" involved its being written down by the operator on board the "Titanic."

The SOLICITOR-GENERAL: Will you tell me what is the practice of your operators in the case of a message of this sort passing through the "Titanic?" Do they treat it as a message which concerns the ship from which it is retransmitted?—In ordinary practice it would be treated as a private message, but the operator, seeing from the contents of it how important it was as regards the navigation of the ship, would, without any doubt whatever, communicate its contents to the commander or officers.

The PRESIDENT: You mean by that that you think he ought to do so?—It is the general practice.

Have you ever been in one of these steamers in the Marconi room?—I have. I made a trip to America in 1904.

Can you recall any case where you received a private message which you thought would be of interest to the captain of the ship you were upon, and which you disclosed to the captain of that ship?—No; I cannot recall any particular instance.

Mr. Turnbull then produced the *procès verbal* of the "Baltic," which showed that the following message was sent at 11.52 a.m. on April 14th to Captain Smith of the "Titanic":

"Have had moderate, variable winds and clear, fine weather since leaving. Greek steamer reports passing icebergs and large quantity field ice in latitude 41.51 N., longitude 49.52 W. Last night we spoke German steamer 'Deutschland,' Stettin to Philadelphia, not under control, short of coal, latitude 40.42 N., longitude 55.11 W. Wishes to be reported at New York and other steamers. Wish you and 'Titanic' all success.—COMMANDER."

The reply of the captain of the "Titanic" to this message was, the witness said, received at 12.55 p.m., and was in these terms:

"Thanks for your message and good wishes. Had fine weather since leaving.—SMITH."

The witness added that the time given in both messages was New York time, and ship's time would be about two hours later.

SIR ROBERT FINLAY (who appeared for the White Star Line): This is the first we have heard of this message.

The PRESIDENT: Do you dispute receiving it?

SIR ROBERT FINLAY: I do not know anything about it. I have not heard of it until this moment.

The Solicitor-General then put in an affidavit made by the captain of the "Baltic" in relation to another message sent to the "Titanic." This was to the effect that on April 14th reports were received by wireless telegraphy from numbers of steamships of having passed ice and bergs in positions varying from 49.9 W. to 50.20 W. on the outward southern track. These ice reports were, in the ordinary course, sent out by the operator to all other ships with wireless apparatus, including the "Titanic." They were sent shortly before noon, New York time. The operator received an acknowledgment from the "Titanic" about 1 p.m., New York time, on the same day.

Mr. Turnbull said that in the *procès verbal* of the "Baltic" there was no record of any message but the message he had mentioned having been sent by the "Baltic" to the "Titanic."

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*Mr. J. Durrant, of the "Mount Temple."*

*Mr. Gilbert W. Balfour,*
Marconi Operator on board the "Baltic," who was on the same vessel when she went to the rescue of the "Republic."

*Mr. Cyril Evans, of the "Californian."*

*Mr. H. T. Cottam, of the "Carpathia."*

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The Solicitor-General pointed out that the report of the evidence given at the American inquiry showed that the captain of the "Baltic" stated that he received more ice messages than one.

The President said he did not doubt that. But that these messages were sent out to the "Titanic," in the sense of having been received by the "Titanic," did not seem to be accurate.

The Solicitor-General said, as regarded the "Californian," they had already evidence from the operator Evans, of that ship, regarding the warning of three large bergs—a warning despatched at 7.30 p.m. on Sunday, ship's time. Evans was sending to the "Antillian," and was told by the "Titanic" operator that he had overheard it.

The PRESIDENT: There is nothing in writing, as far as I know, to show that this "Californian" message was received by Captain Smith?

SIR R. FINLAY: No.

The Solicitor-General next mentioned the warning sent by the "Mesaba" (Atlantic Transport Line), which, he said, was the "critical message."

SIR R. FINLAY: This we say we did not receive.

The PRESIDENT: Yes; but the "Californian" overheard it.

The witness produced the record of the "Mesaba's" message. There was first a "Time Rush" message, dated 7.50 New York time, stating that an ice report had been sent to the "Titanic." Mr. Turnbull explained that a "Time Rush" message was a preliminary telegram to inform a ship of the telegrams ready to be despatched for it. He then read the message, dated 7.50 p.m., and sent by S. H. Adams, the "Mesaba's" operator, to the "Titanic":

"Ice report.—In latitude 42 N. to 41.25 N., longitude 49 W. to 50.30 W., saw much heavy pack ice and great number of large icebergs, also field ice. Weather good, clear." At the bottom of the same form there appeared this entry by the "Mesaba's" operator: "Reply received, thanks. Sent this to about ten other ships as well; names in P.V. (*procès verbal*)." The reply, Mr. Turnbull explained, would be sent by the "Titanic's" operator, not by the captain.

Mr. H. Bride was then called and examined by the Attorney-General. He said that in June, 1911, he obtained his certificate of proficiency in radial telegraphy from the Postmaster-General, and later on he was appointed by the Marconi Company to serve as assistant wireless operator in the "Titanic." He joined the "Titanic" at Belfast in the beginning of April. On the trial trip of the ship from Belfast to Southampton, Phillips, the senior operator, and he tested the wireless apparatus with several stations on the mainland and found it in good working order. The arrangement as to the watches they had made was that Phillips was to go on duty from 8 o'clock at night till two in the morning, and the witness from 2 o'clock in the morning until eight. During the day they took turns to suit one another's convenience. But a continuous and constant watch was kept, and one or other of them was always in the Marconi room, which was close to the bridge.

Will you tell us as far as you are able what was the first message you recollect with regard to ice?—The first message I recollect on April 14th was from the "Californian."

That was the first you recollect?—And the last.

Had you any messages before the 14th?—No, sir.

What was the message you recollect receiving on the 14th? Do you recollect the time?—The time was between 5 and 5.30 in the afternoon, ship's time. It stated that the "Californian" was passing close to a large iceberg. She gave the latitude and longitude.

Was that a message intended for you or which you overheard?—It was a message which was intended for me in the first place and which I overheard afterwards.

Do you always write the messages down which you receive?—Yes, sir.

Is that an invariable practice?—Invariable.

Do you also write the messages which you send?—They are generally written for us.

And put before you for transmission?—Yes, sir.

The witness added that to the best of his recollection the message from the "Californian" which he overheard was intended for the "Baltic," and was acknowledged by the "Baltic." At the time he overheard this message he was aware that the "Californian" had the same message for the "Titanic."

The Attorney-General read an extract from the evidence given by Bride in America to the effect that the message from the "Californian" which he had overheard was that they had seen three large bergs five miles to the southward of them; and that it was sent to the "Antillian."

The witness said he might have had it in his mind when he reached New York that the message was sent to the "Antillian." He was very busy on the Sunday, and had had many communications.

The ATTORNEY-GENERAL: What did you do when you got this message from the "Californian"?—I delivered it to the officer on the bridge.

Do you remember who the officer on the bridge was?—No; I was not acquainted with the officers.

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Can you tell us how long it was after you got the message that you delivered it to the bridge ?—Two minutes.

Did it strike you as an important message ?—That sort of message is looked upon as important.

The President asked whether there was any doubt that this message did come to the knowledge of the officers on the bridge.

SIR ROBERT FINLAY : I think there is no doubt at all. The point is—when ?

The ATTORNEY-GENERAL : This witness says two minutes after it was received. (To the witness) : From the time you received that message until the " Titanic " sank, as far as you are concerned, there was no other ice reported ?—No, sir.

Did you have any conversation at all with Mr. Phillips about ice messages ?—No, sir.

The witness said he was relieved by Phillips between 6 and 7 o'clock—to the best of his recollection—in order that he might go down to dinner.

The witness said, in reply to the Attorney-General, that when he did come up from dinner he had a conversation with Phillips in the Marconi room. Phillips established communication with Cape Race between 8.30 and 9 o'clock.

The PRESIDENT asked how did he know that Phillips established communication with Cape Race at that time ?

The witness said that he had " turned in," and as his sleeping place adjoined the instrument room he could read by sound the messages that Phillips was sending to Cape Race.

The PRESIDENT remarked that the witness's memory appeared to be so extraordinarily accurate as to time that, while he did not say the witness was not telling the truth, he wondered whether he could really remember details so distinctly.

The witness said he remembered these things because they constituted his work.

Replying to the Attorney-General, he said he particularly remembered communication being established with Cape Race. It was very important that they should get into communication with Cape Race because there was a large accumulation of messages awaiting despatch.

The PRESIDENT said that would explain how the witness remembered so well.

The witness proceeded to say that he relieved Phillips at 12 o'clock midnight—two hours before he was regularly due—because Phillips had had a busy time the night before. That was after the collision. Phillips then told him that he had cleared off the traffic to Cape Race, but Phillips did not say when he had actually completed the work. It was not until then that the witness heard that there had been a collision. He was asleep at the time of the impact. Phillips told him he thought the ship had struck something from the feel of the shock that followed. They were not then sending or receiving messages. The captain came into the Marconi room shortly afterwards and said he wanted assistance from other vessels. Mr. Phillips was told to be quick about it, so he set about sending " C.Q.D." immediately. Answers were received from the " Frankfurt " and the " Carpathia." The " Frankfurt " wired, " O.K. (all right), stand by " (*i.e.*, wait for further reply). The " Frankfurt " gave no position. The " Carpathia " transmitted her position, said she had turned, and was coming along as fast as possible. The " Olympic " sent several messages right up to the time when they finally left the cabin, but he believed they were not delivered, because they presumed that Captain Smith was busy. The effect of one of the messages was to tell Captain Smith to have his lifeboats ready. He went to report to the captain, who was on the boat deck superintending the lowering of the lifeboats. Later, the captain came into the Marconi room and told them the ship would not last very long, and that the engine-room was flooded. Mr. Phillips thought that the " Frankfurt " was the nearer of the two vessels, as the strength of the " Frankfurt's " signals was greater than that of the " Carpathia's." He informed the " Baltic " that they had had a collision and were sinking fast. Mr. Phillips had then gone outside to look round, and when he came back he said that the fore well-deck was awash, and that they were putting the women and the children in the boats and clearing off. Then the captain came in and told them to shift for themselves, because the ship was sinking.

Were you at that time called up ?—Yes, Mr. Phillips took the telephones up when the captain had gone away and started to work again. He could read what Phillips was sending, but not what he was receiving, and he judged that the " Carpathia " and the " Frankfurt " had both called up together ; the " Frankfurt " had persisted in calling them, and was interfering with Mr. Phillips's reading of the " Carpathia's " message. Mr. Phillips expressed his opinion of the " Frankfurt," and told the operator of that vessel " to keep out of it and stand by." Mr. Phillips then told the " Carpathia " that they were abandoning the ship. Mr. Phillips tried to call once or twice more, but the power (which they got from the engine-room) was failing, and they failed to get any replies.

Then he and Phillips lined up on top of the Marconi cabin in the officers' quarters. They were trying to fix up a collapsible boat, and he helped to get it down from the top deck to A deck. He got into it, but as the vessel sank it was floated off upside down. He was swept off

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the boat deck. When he last saw Mr. Phillips he was standing on the deck-house. The witness said he swam away from the collapsible boat, but he joined it three-quarters of an hour later.

Mr. Lightoller, one of the ship's officers, was then recalled, and said, in answer to Sir R. Finlay, that he never heard anything whatever of the message which was said to have been sent from the "Mesaba," and which should have reached them before 10 p.m. He also had heard nothing of the message supposed to have been sent from the "Amerika."

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And are you positive that you never heard anything?—Absolutely positive.

The witness said that he saw the captain on the bridge on the night of the disaster from 8.55 to 9.20.

A message such as that from the "Mesaba" would be one that would be communicated to him?—I have no doubt that it would be immediately communicated to him if it referred to pack ice.

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Mr. Lightoller was examined with reference to the calculation he made on the day of the casualty that they would be up to the ice region by 9.30 p.m., whereas Mr. Moody had calculated that they would not reach it until 11 p.m. He said he had come to the conclusion that Mr. Moody in forming that estimate did not take the same wireless telegram that Captain Smith had shown to him (Mr. Lightoller).

The SOLICITOR-GENERAL: If you take the "Baltic's" marconigram you would, according to that, be up to the ice about 11 o'clock. Did you know that?—No, I did not.

You know the "Caronia" mentioned that you would get to the ice on the 49th meridian. And your impression at the time was, not that Mr. Moody had made a mistake in his calculation, but that he had used another marconigram?—Exactly.

The "Baltic's" message would reach the "Titanic" about 1 p.m. Do you observe that if you told Mr. Moody at 6 p.m. about the ice message, the "Baltic" message would be a later message in point of time than the "Caronia's"?—I see. But my instructions to Mr. Moody would direct him to look for the easternmost ice.

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beautifully drawn and appropriate menu card, which had been artistically designed by Dr. Drake-Brockman.

Mr. J. C. Hawkshead has returned to London after having served during the last six months as Marconi operator on board the yacht "Mahroussa," owned by H.H. The Khedive. Mr. Hawkshead landed in Alexandria on October 25th, 1911, and completed the installation of the Marconi apparatus on board the "Mahroussa." Amongst the interesting tours made on board the yacht was to Port Said to meet King George, who was then on his way to India. During the last fortnight of Mr. Hawkshead's stay on board a voyage was made to Dolman, in Turkey-in-Asia, at which place His Highness the Khedive spent ten days on a large estate owned by him there. Since his return to this country Mr. Hawkshead has received from His Highness a gold monogram scarf-pin with the letters "A. H.," signifying Abbas Hilmi (the Khedive's name), surmounted by a crown, "As a souvenir of the time you have served as Marconi operator on board the 'Mahroussa,' and as a mark of the Khedive's appreciation of the manner in which you carried out your duties."

Mr. A. A. Kift, the chief of the estimating department of Marconi's Wireless Telegraph Co., who was married in London on April 27th, was presented by the directors of the company and his colleagues on the staff with a handsome canteen of cutlery.

## Movements of Operators

C. E. Rookes, from the Marconi School to the "Teutonic."
W. C. Banbery, from the "Hilary" to the "Ambrose."
G. H. Sellars, from the Marconi School to the "Delaware."
A. Braddock, from the Marconi School to the "Campania."
A. H. Millard, from the Marconi School to the "Canadian."
C. Sandbach, from the "Elmina" to the "Celtic."
R. Jones, from the Marconi School to the "Dominion."
C. V. Coster, from the "Vandyck" to the "Irishman."
L. B. Cleary, from the "Ivernia" to the "Nigeria."
A. Fletcher, from the "Campania" to the "Vandyck."
G. E. Kemp, from the Marconi School to the "Minnetonka."
W. H. Monger, from the "Mooltan" to the "Mongolia."
K. W. Page, from the "Mongolia" to the "Danube."
G. Walters, from the "Moravian" to the "Madeja"
H. Rowlands, from the "Minnehaha" to the "Lake Michigan."
A. M. Howlett, from the "Devanha" to the "Orontes."
H. J. Gallagher, from the "Orontes" to the "Success."
W. J. Brown, from the "Dongola" to the "Walmer Castle."
G. Balding, from the "Minnehaha" to the "Minneapolis."
G. Kemp, from the "Minnetonka" to the "Potomac"
A. Fletcher, from the "Vauban" to the "Minnetonka."
E. Ogilvie, from the "Mantua" to the "Moldavia."
J. Simmons, from the "Moldavia" to the "Mooltan."
A. Rawlings, from the "Minnewaska" to the "Commonwealth."
B. Montgomery, from the "Navahoe" to the "Minnewaska."
A. Cookson, from the "Delta" to the "Marmora."
C. Sharpe, from the "Caledonia" to the "Goorkha"
J. Smith, from the "Cedric" to the "Oceanic."
S. Branton, from the "Corsican" to the "Miltiades."
E. Rumford, from the "Galeka" to the "Montfort."
H. Hardy, from the "Kildonan Castle" to the "Caledonia."
A. Blow, from the "Beltana" to the "Kildonan Castle."
A. Bower, from the "Demosthenes" to the "Majestic."
C. Weller, from the "Otranto" to the "Matatua."
W. Merryweather, from the "Carmania" to the "Sicilian."
A. Langley, from the "Intaba" to the "Geelong."
C. Evans, from the "Californian" to the "Perugia."
P. Brownfield, from the "Perugia" to the "Navahoe."
W. Syme, from the "Ansonia" to the "Potaro."
C. Masters, from the "Carisbrook Castle" to the "India."
E. Dexter, from the "Sicilian" to the "Grantully Castle."
W. Estlick, from the "Saxon" to the "Walmer Castle."
R. Atkinson, from the "Antillian" to the "Falaba."
J. Howard, from the "Asian" to the "Teutonic."
A. Jeffries, from the "Connaught" to the "Ulster."
W. Wing, from the "Empress of Ireland" to the "Corsican."
J. Boadella, from the "Mauretania" to the "Canadian."
A. Millard, from the "Canadian" to the "Lake Michigan."
G. Tyler, from the School to the "Empress of Ireland."
J. McLeod, from the "Ortega" to the "Mamari."
T. W. Murray, from the School to the "Merion."
C. Crossman, from the "Laconia" to the "Asian."
A. Cottingham, from the School to the "Cymric."
A. Bolster, from the School to the "Dominion."
F. Milford, from the "Herefordshire" to the "Hubert."
C. Peters, from the "Stephen" to the "Hyacinthus."
A. Lund, from the "Akabo" to the "Victorian."
A. V. Jones, from the School to the "Adriatic."
F. W. Garwood, from the "Andorinha" to the "Akabo."
R. McCutcheon, from the "Arabic" to the "Andorinha."
R. Darracott, from the "Empress of Britain" to the "Antillian."
W. C. Obey, from the School to the "Arabic."
L. A. Hancock, from the "Cestrian" to the "Californian."
C. Burgham, from the School to the "Canada."
W. Thomas, from the School to the "Canopic."
H. Miller, from the School to the "Caronia."
W. Banbery, from the "Ambrose" to the "Cheyenne."
J. Camfield, from the School to the "Empress of Britain."
W. G. Sutherland, from the "Leicestershire" to the "Herefordshire."
G. Sellars, from the "Caronia" to the "Hermione."
A. Jamieson, from the "Adriatic" to the "Ortega."
T. Rhodes, from the School to the "Tunisian."

## Movements of Engineers

A. B. Blinkhorn has joined the London Offices Staff of the Ship-fitting Department.

E. E. Robinson, P. Boucicault, and L. S. Hawkins sailed for Glace Bay on 9th May.

O. Trost has returned from Copenhagen, where he was fitting the Danish cruiser "Absolon," and is now engaged on directional tests at Chelmsford.

R. R. Cooke, J. D. White, and H. McCullough are on their way home from India.

C. G. Rattray has returned from Soller, and is now on sick leave.

G. J. Boome is attached to the Ship-fitting staff

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THE MARCONIGRAPH

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# Ocean Weather Warnings

ACCORDING to the *Standard*, a proposal for the co-operation of the leading nations of the world in the making of daily observations of weather conditions by ships at sea and their transmission to central points by wireless telegraph has been submitted to the International Radiotelegraph Conference. The author of the far-reaching scheme is Professor Willis L. Moore, chief of the United States Weather Bureau.

Professor Moore's project is to have all ships send daily at noon (Greenwich time) a code message of two or three words, reporting their location and observations of the weather to central stations at different points. From this information the central stations could tell the exact position of storms and other meteorological disturbances, and send out a timely warning to ships within the danger zone.

"It would be a simple matter," explained Professor Moore to a *Standard* representative, "to put this plan into operation on the Atlantic Ocean to begin with. Then, if results proved as satisfactory as expected, it could be extended to all other oceans. The advantage to commanders of ships at sea of knowing daily the exact situation of storm centres and fair weather zones is obvious. While the scheme may not be quite so simple as it looks, it is wholly practicable and feasible. Ships east of the fortieth meridian, which is the middle of the Atlantic, would have to relay all observations received from ships further west, but on the same meridian, or further east, this would not be necessary. It is only in this way that observations on the European coast could be gathered, while a reversal of the same process would operate in the western half of the ocean. All the information could then be gathered at one central point in North America and another in Europe—preferably in England.

"An international agreement, however, is all-important, in order to provide for all observations at sea being taken exactly at noon (Greenwich time). This would ensure that the observations so made would be passing through the air within the next quarter of an hour, and commanders would be on the look-out to relay them to the shore. The taking of these observations, of course, would have to be made compulsory and simultaneous to be of any value to maritime commerce. The efficiency of the service also depends largely upon the rapidity with which the information is transmitted, but I believe the commercial interests would raise no serious objection to having their business delayed for the very brief time necessary to transmit two or three code words. Wireless and shipping companies ought to be glad to co-operate in a scheme so beneficial to the world's commerce, though I fear they will not—at any rate, in the beginning."

Professor Moore believes that his own Government will put the scheme into operation within the next few months, so far as it is possible for one nation to do so, even if the conference takes no action in the matter.

"On my return to the United States," he said, "it is my intention to recommend to Congress the establishment of a service on the same lines as that which is to be put into operation on July 1st in the western part of the Atlantic. We already have 32 paid observers on vessels plying between our northern ports and the West Indies who were specially trained for this service last winter. Beginning next month, and extending through the hurricane season, they will send observations daily to Washington, and the necessary warnings and information will be immediately sent back to ships in the threatened area."

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SIR H. BABINGTON SMITH.

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# Sir Henry Babington Smith, K.C.B., C.S.I.

**Chief British Representative at the International Radio-Telegraph Conference**

LAST month, in our biographical sketch, we dealt with one of the rulers of Empire — the President of the Board of Trade. This month we deal with one who has never sat in the House of Commons, but who, nevertheless, has played his part in the guidance of the destinies of our country. Sir Henry Babington Smith was from 1903 to 1909 the Secretary to the Post Office—the power behind the Throne who remains while Ministers come and go, and who ensures continuity of working despite political upheavals.

Scientific blood runs in his veins, for he is the son of the late Archibald Smith, F.R.S., having been born in 1863. He was educated at Eton and Trinity College, Cambridge, of which he is a Fellow, and during his University career he distinguished himself in the Classical Tripos, and was also the Chancellor's Medallist. After spending some four years as Examiner in the Education Department, he became in 1891 private secretary to the Chancellor of the Exchequer, Mr. Goschen, the man whom Lord Randolph Churchill " forgot " on an important occasion in his life. In the following year he became clerk to the Treasury, and acted as secretary to the British delegates to the Brussels Monetary Conference ; after which he became private secretary to the Earl of Elgin, then Viceroy of India. For his services in India he was in 1897 honoured with the C.S.I. After leaving India in 1899, and a brief stay in Natal, he went to Turkey as British Representative on the Council of Administration of the Ottoman Public Debt, of which he became President in 1901. In 1903, as already stated, he became Secretary to the Post Office, where he remained until 1909. During this time he was the British delegate at the Postal Congress in Rome in 1906. at the Telegraph Conference in Lisbon in 1908, and, what is of especial interest to us, at the International Radio-Telegraph Conference in Berlin in 1906.

Sir H. Babington Smith was also concerned in the development of the London telephone service, the utility of which was greatly increased under his able guidance. At one time he was instrumental in averting what might have been almost a national disaster—a fierce war between the Post Office and the National Telephone Company. The negotiations which Sir Henry Babington Smith conducted were successful in averting this, and by preventing ruinous competition he effected an enormous national saving.

In 1909 he returned to the scene of his earlier activities, and became Director of the National Turkish Bank. He is now the principal British delegate to the International Radio-Telegraph Conference, and is the chairman of that Conference. He is a polished orator, with an intimate knowledge of the conduct of business, and a very genial manner, all of which qualities make him a most desirable occupant of the chair. His oratory and his geniality also make him a very welcome guest on public occasions, and he is one of the few whose after-dinner speeches can be listened to with attention and interest.

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# The International Conference

THE International Radio-Telegraphic Conference opened in London at the Institution of Electrical Engineers, Victoria Embankment, on June 4th. Public interest in this gathering has been greatly stimulated by the discussions as to the use of wireless telegraphy in connection with maritime disasters, as well as by the fact that the present conference is the first to be held in Great Britain. Both the previous conferences were held in Berlin, the first in 1903 and the second in the autumn of 1906, when a principal list of twenty-three statutes was adopted for proposed ratification by the respective countries, representing a secondary list of three articles, and a final protocol of six articles. This constituted the main text of thirty-two articles in all, most of which were quite short, so that the main text was a comparatively compact document. This was followed, however, by an appendix of service regulations containing no fewer than forty-two articles. The primary objects of the 1906 Convention may be classified as follows :

1. The acceptance and transmission of telegrams.
2. The adoption of rules of working.
3. The provision of means of collecting charges and settling accounts between the different countries.
4. Arrangements for the publication of all information necessary for inter-communication.
5. The rules to prevent interference and confusion in working with adequate provisions for enforcement.
6. Provision that with certain exceptions inter-communication must not be refused on account of the differences in the systems of wireless telegraphy employed.

Below we give a list of the delegates attending the conference under the names of the countries which they represent.

RECEPTION COMMITTEE.

Capt. Cecil Norton, M.P.
Mr. A. B. Walkley.
Mr. H. Davies, I.S.O.
Mr. A. G. Ferard.
Mr. W. H. M. Selby, M.V.O.
Mr. I. de Wardt.
Mr. A. T. Taylor (secretary).

INTERNATIONAL BUREAU.

Herr A. Crescitz.
M. J. Homberger.
Herr Fr. Schwill.

GOVERNMENT DELEGATES.

*Germany :*
Herr Koehler.
Herr Wachenfeld.
Dr. Strecker.
Herr Schrader.
Herr Goetsch.
Dr. Krauss.
Capt. Fielitz.
Dr. Beggerow.
Herr Barckhausen (attaché).

*United States :*
Rear-Admiral John R. Edwards.
Capt. David W. Todd.
Dr. Louis W. Austin.
Major George O. Squier.
Commandant Edgar Russel.
Commandant C. McK. Saltzman.
Mr. John I. Waterbury.
Dr. Arthur G. Webster, M.R.A.S.
Mr. John Hays Hammond, jun.
Mr. W. D. Terrell.
Professor Willis L. Moore.
Mr. John Q. Walton.
Mr. F. A. Kolster (attaché).

*Argentine (Republic) :*
His Excellency M. J. V. Dominguez.
M. Augustin Sal.

*Austria :*
Dr. Wagner von Jauregg.
Dr. Rudolf Speil von Ostheim.
Herr A. Linninger (attaché).
Baron F. von Teufenstein (attaché).

*Hungary :*
Herr Charles Follert.
Dr. G. Hennyey de Hennye.
Herr J. Hollós (attaché).

*Bosnia-Herzegovina :*
Major-General H. Goiginger.
Herr A. Daninger.
Herr J. Pranboeck.
Capt. J. Glatter.
Capt. A. Cicoli.
Lieut. Romeo Vio.

*Belgium :*
M. J. Banneux.
M. A. Deldime.
M. Robert Goldschmidt.
M. René Corteil (attaché).

*Brazil :*
M. Francisco Bhering.

*Bulgaria :*
M. Ivan Stoyanovitch.

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*Chili :*
M. Carlos E. Rickaldes.
M. Angel C. Ramirez.

*Denmark :*
M. N. Meyer.
M. J. A. Voehtz.
M. R. N. A. Faber.
M. T. F. Krarup.

*Egypt :*
Mr. J. S. Liddell.

*Spain :*
Col. Garcia Roure.
Capt. Fernandez Quintana.
Capt. Juan Carranza.
Lieut. Jaime Janer Robinson.
M. Jacinto Labrador y Guzman.
M. Nieto y Gil.

*France :*
M. A. Frouin.
M. V. Belugou.
M. L. Poulaine.
M. Cartier.
M. Ferrié.
Capt. Fossey.
Lieut. du Paty de Clam.
M. Duchêne.
M. Morgat.
M. Michel.
Capt. Brenot.
M. de Felcourt.
M. Bouthillon.
M. Lacombrade (attaché).

*Great Britain :*
Sir H. Babington Smith, K.C.B., C.S.I.
Mr. E. W. Farnall, C.B.
Mr. R. J. Mackay.
Mr. F. W. Home.
Capt. F. G. Loring.
Capt. E. F. B. Charlton.
Capt. W. R. W. Kettlewell.
Lieut. John A. Slee.
Lieut.-Col. G. M. W. Macdonough.
Major R. H. H. Boys, D.S.O.
Mr. J. Louden.
Mr. A. W. Cross.
Mr. J. E. Taylor.
Mr. W. B. Harris, Mr. A. Gordon, Mr. F. Addey. } Joint Secretaries of the conference.

*British Colonies :*
*Union of South Africa :*
Sir Richard Solomon, G.C.M.G.
Mr. T. S. Nightingale.
*Australia :*
Mr. Charles Bright.
*Canada :*
Mr. G. J. Desbarats.
Mr. C. P. Edwards.
*British India :*
Sir H. A. Kirk, K.C.I.E.
Mr. F. E. Dempster, C.I.E.

*New Zealand :*
Mr. C. Wray Palliser.
Mr. T. E. Donne.

*Greece :*
Lieut. Constantine Dosios.

*Italy :*
Professor A. Battelli.
Commander Q. Majorana.
Dr. Chevalier Enrico Mirabelli.
Commander V. Pullino.
M. le Chevalier C. Rey di Villarez.
Professor Chevalier G. Vanni.
Chevalier G. Bardelloni.
Chevalier G. Gneme.

*Japan :*
Capt. Kenji Ide.
Lieut.-Commander Seiichi Kurose.
M. Tetsujiro Sakano.
M. Riuji Nakayama.
M. Harumichi Tanabe (attaché).

*Morocco :*
Cid Mohammed bel Abbas el Kabbaj.
M. Asensio.

*Monaco :*
His Excellency M. F. Roussel.
Baron A. Berget.

*Norway :*
M. Heftye.
M. K. A. Knudssoen.
Lieut. B. L. Gottwaldt.
Lieut. Skolem.

*Netherlands :*
M. J. P. Guépin.
M. G. J. C. A. Pop.
M. H. J. Nierstrasze (attaché).
M. J. J. Perk.
M. F. van der Goot.

*Persia :*
M. Mirza Abdul Ghaffar Khan.
M. Casey.

*Portugal :*
M. A. M. de Silva.

*Roumania :*
M. Cesar Boerescu.
M. C. Vidic (attaché).

*Russia :*
M. de Etter, C.V.O.
Professor Ossadtchy.
Col. Euler.
M. Serguéievitch.
Baron de Wyneken.
Lieut.-Col. Sokoltzov.
Lieut. Schmitt.
Capt. Dmitriev.
Lieut. M. Stchastnyi.
M. Skritsky (attache).

*St. Marino :*
Commander Arturo Serena.

*Siam :*
Luang Sanpakitch Preecha.
Mr. W. J. Archer, C.M.G.

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*Sweden :*
M. Sven Ludvig Herman Rydin.
Count Hennig Adolf Hamilton.

*Turkey :*
Mehmed Emin Bey.
Fahry Bey.
Lieut. Osman Saadi Bey.

*Uruguay :*
His Excellency M. F. R. Vidiella.

REPRESENTATIVES OF WIRELESS TELEGRAPH COMPANIES.

*Marconi's Wireless Telegraph Co., Ltd .:*
Commendatore G. Marconi.
Mr. Godfrey C. Isaacs.
Mr. W. W. Bradfield.

*Siemens Bros. & Co., Ltd. :*
Mr. Hird.

*La Compagnie Generale Radiotelegraphique :*
M. Bordelongue.
M. Sins.

*La Société Française Radio-électrique :*
M. Girardeau.
M. E. Wormser.

*La Compagnie Française, Maritime, et Coloniale de Telegraphie sans Fil (système Marconi) :*
Baron de la Chevreliêre.

*La Compagnie de Telegraphie sans Fil (Belgium) :*
M. Maurice Travailleur.

*Gesellschaft für drahtlose Telegraphie m. b. H. :*
Count von Arco.

*Deutsche Betriebsgesellschaft für drahtlose Telegraphie (Debeg) :*
Mr. H. Bredow.

*La Compania Nacionale di Telegrafia sin Hilos :*
Count Albiz.

*The Telefunken Wireless Telegraph Co. of the United States :*
Dr. A. V. Ostheimer.
Mr. R. Pfund.

*C. Lorenz Aktiengesellschaft :*
Herr O. Scheller.

According to reports which have appeared in the Press, several points of public interest were to be discussed. The compulsory equipment of all passenger vessels fitted with wireless was, according to one report, to receive consideration, and from the same source we learn that the delegates would be asked to give a ruling as to whether the continuous attendance of an operator at the apparatus should be made obligatory. The proceedings were held in private, and only two official communications have been issued. The first of these gave a summary of the opening day's proceedings, when the Postmaster-General welcomed the delegates in the name of the King and the Government.

Speaking in French, Mr. Herbert Samuel said that since the Radio-Telegraphic Convention was arrived at in 1906 wireless telegraphy had increased rapidly in importance, particularly in its function of assisting and safeguarding navigation. But it was not to be supposed that a Convention, however far-seeing it might be, could be prepared for all eventualities or could anticipate the developments in the application of a young and vigorous science. It was evident that the regulations made in 1906 required to be extended, improved, and even in part recast. The recent disaster to the " Titanic " had given prominence to the need of a fuller use of wireless telegraphy at sea, and of the discovery of fresh methods to enable it to discharge more efficiently its important duty of preventing disasters and of aiding in the work of rescue. Certain measures necessary or desirable for that end lay perhaps outside the limits of the Convention which that Conference was summoned to consider. It was possible that among these would be found the measures relating to the compulsory installation of wireless telegraphy on board ships. However that might be, His Majesty's Government, so far as the United Kingdom was concerned, and, he did not doubt, the other Governments also, would welcome the opinions of that great assembly on the subject, particularly in respect of the uniformity which might be found possible in the laws that each country might enact to give effect to a wider use of wireless apparatus.

Herr Koehler (Germany) expressed the great satisfaction it was to the Conference to meet in London, the greatest metropolis of the world and the greatest centre of commerce and navigation. On behalf of the Conference he requested the Postmaster-General to convey their respectful homage to the King.

This request was supported by M. Perk, the *doyen* of the Conference.

In reply the Postmaster-General undertook to convey the message to His Majesty. He regretted that his Ministerial and Parliamentary duties would prevent him from taking part in the sittings of the Conference, and he proposed that the president's chair should be taken by Sir Henry Babington Smith, whom many of them would know as a former Secretary to the British Post Office. He wished the best success to the deliberations of the Conference.

The following official announcement was issued on June 12th :

" The International Conference for revising the rules for communicating by means of wireless telegraphy between ships at sea and the shore, and between ships themselves was opened by Mr. Herbert Samuel, the Postmaster-

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General of the United Kingdom, on June 4th; and the members, who include representatives from some 30 different countries, have since been sitting almost daily in the hall of the Institution of Electrical Engineers, on the Victoria Embankment.

"The work of the Conference is to consider the proposals made by the different countries for the improvement of the International Convention made at Berlin in 1906—the first International Convention for the regulation of wireless telegraphy.

"The bulk of the proposals are being considered by committees presided over respectively by the heads of the French and German delegations. The decisions of these committees are subject to approval by the full Conference, whose President is Sir H. Babington Smith, the principal delegate of the United Kingdom.

"Apart from the inaugural meeting, the full Conference, which must necessarily await reports from the committees, has had only one sitting. At this sitting an announcement was made of the acceptance by the United Kingdom and the British Dominions, and also by Italy

*Mr. Herbert Samuel, M.P., on left, Captain Cecil Norton, M.P. (centre), and Mr. Ferard (right).*

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*Mr. E. W. Farnall, C.B.*

*Captain E. E. Charlton.*

*Commander F. G. Loring.*

*Mr. A. Taylor*
*(Secretary of the Entertainments Committee).*

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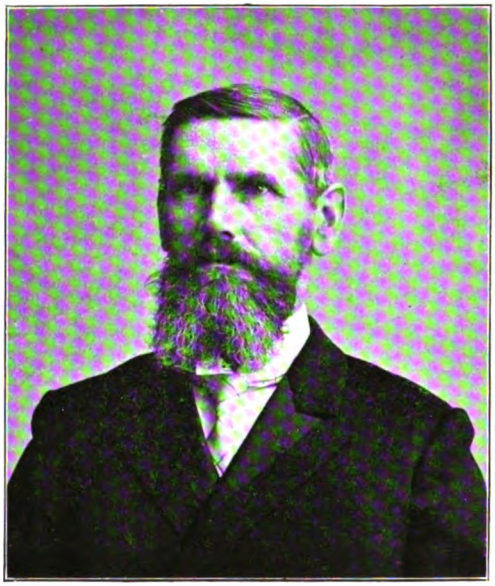
*Dr. Hans Beggerow.*



*M. J. Homberger.*

*Luang Sanpakitch (Siam).*

*Dr. E. Mirabelli.*

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*The Japanese Representatives.*

and Japan, of the principle that ships must accept messages from other ships, whether or not they use the same system of wireless telegraphy. This principle had not hitherto been accepted by the above-mentioned countries except for messages relating to cases of distress ; its general application has now been approved by practically all countries.

"Another matter of importance decided is the allocation of votes to Colonial Possessions. The *maximum* number of votes permissible for any one country and its possessions under the Convention has been allotted to the British Empire. These votes are assigned to Australia, Canada, India, New Zealand, and South Africa, in addition to the vote held by the United Kingdom itself. Votes have also been allotted to the Colonies and dependencies of Belgium, France, Germany, Holland, Japan, and Portugal.

"It has already been announced that His Majesty's Government intend, as a result of the 'Titanic' disaster, to ask the Conference to consider what improvements can be made with a view to secure the best possible use of wireless telegraphy for the saving of life at sea and the security of navigation. It is expected that this matter—perhaps the most important which the Conference will consider—will be discussed at a full meeting.

"The rapid extension of the use of wireless telegraphy is shown by some figures in a report presented to the Conference by the German delegation. It appears from this report that in

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the last four years the number of ships, excluding warships, equipped with wireless telegraphy has increased from 52 to 926, and that during the same period the number of coast stations open for general public correspondence has increased from 14 to 155. The total number of ships of all sorts equipped with wireless telegraphy is stated to be 1,577, and the total number of coast stations is 286."

An interesting and varied programme of social events was provided for the entertainment of the foreign delegates and their wives during their stay in London. Foremost was the reception of His Majesty the King, at Buckingham Palace, on June 10th. The inaugural banquet was given by the Postmaster-General on June 5th, and during the course of the evening Mr. Samuel, speaking in French, welcomed the delegates to London in the name of His Majesty's Ministers. He expressed the hope that the Conference would be the means of creating new personal ties between its members and thus binding still closer friendly international relations. Just as in the realm of science, if the ether did not exist in fact, it would have to be invented, so if occasions for convening international conferences did not arise of themselves it would, he said, be almost necessary to make them. Ambassadors fulfilled functions very necessary to the peace of the world; the delegates of such conferences were the ambassadors of their particular services, and the nations they represented reaped from their meeting advantages wider even than the actual results of their deliberations.

Mr. Samuel then addressed to the delegates a few words of welcome in German, Italian, and Spanish, and referred to the devotion to science manifested by the Teutonic peoples, to the great share played by Italy in the development of wireless telegraphy through the genius of Mr. Marconi, and to the interest felt in England in the remarkable progress of the States of Southern America.

Among those present were Captain Norton, M.P., Assistant Postmaster-General; the Argentine and Uruguayan Ministers, M. F. Roussel, Secretary of State, Monaco, Sir Richard Solomon, the Hon. Sir William Hall Jones,

*Portion of the Party Entertained to Dinner at the Savoy.*

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*The Turkish Delegates.*

the Hon. C. Wray Palliser, Sir Oliver Lodge, Sir Matthew Nathan, Sir Henry Babington Smith, Mr. E. Crabb, C.B., and Mr. A. M. J. Ogilvie, C.B.

The British delegation also entertained the visitors to dinner, and receptions were given by the Postmaster-General, the First Lord of the Admiralty, and the Goldsmiths Company. The afternoon of June 8th was passed at Hurlingham, and a visit was paid in the evening to the Royal Military Tournament. On June 15th an enjoyable afternoon was spent on the upper reaches of the Thames, and a visit paid to Sir Henry and Lady Vansittart Neale. No list of social events in June would be complete without a visit to Ascot Races, and the visit of the delegates to the course on June 18th could not possibly have been under more enjoyable conditions. On June 20th a visit was paid to the Siemens Works at Woolwich, and two days later, June 22nd, the new Marconi works at Chelmsford were visited by the delegates, the Marconi Company entertaining about four hundred guests to dinner during the evening.

## Conference Portraits

COMMANDER F. G. LORING, who is a British delegate, besides being a captain in the Navy, is Inspector of Radio-telegraphy to the Post Office.

* * * * *

M. J. HOMBERGER, who was born in 1854 at Zurich, entered the telegraph service of the Swiss Federal Administration in 1871. After 10 years' service in various telegraph offices and in the Central Bureau at Berne, he entered the International Bureau of the Telegraph Union, where he rose step by step until he became First Secretary. M. Homberger took part, as Secretary, in the International Telegraph Conferences of Budapest (1896), London (1903), Lisbon (1908), and in the present London conference.

* * * * *

CAPTAIN CECIL WILLIAM NORTON, the Assistant Postmaster General, is largely responsible for the smooth running of the International Radio-Telegraphic Conference, for although he is not a delegate, he is chairman of the Entertainment Committee. He is an experienced Parliamentarian, having sat for West Newington since 1892, after unsuccessfully contesting Great Yarmouth in 1885 and 1886, and before occupying his present office he was a Junior Lord of the Treasury. Besides his political experience, he has served for some years in the 5th Royal Irish Lancers.

* * * * *

CAPTAIN EDWARD F. CHARLTON, A.D.C., is one of the Admiralty delegates. He is Director of Torpedoes in the Naval Ordnance Department, which position he has held for the last year. From 1909 to 1911 he was Commodore of the First Destroyer Flotilla.

* * * * *

DR. HANS BEGGEROW, one of the German delegates, was born on September 30th, 1874, and was educated in the Universities of Berlin and Freisburg-Breisgan, where he obtained the degree of Doctor of Philosophy. Since 1901 he has been in the German Admiralty as expert in all matters concerning wireless telegraphy, and since 1906 he has occupied a similar position in the Prussian Army. He has been a delegate at all three Radio-Telegraphic Conferences.

* * * * *

LUANG SANPAKITCH is the Siamese Chargé d'Affairs, and is delegate for Siam at the International Radio-Telegraphic Conference.

* * * * *

DR. ENRICO MIRABELLI, one of the Italian delegates, is chief of the wireless telegraph department of the Postal and Telegraph Office.

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# Conference Delegates Visit Marconi Works

THE visit of the delegates and their friends to the new Marconi works at Chelmsford on Saturday, June 22nd, may be summed up in the words of one of the delegates: "Of the many memorable days the delegates had spent in London in connection with the conference, that day's visit to the Chelmsford works was the most memorable and instructive." Better weather could not possibly have been chosen for the visit, and the county town of Essex smiled a genial welcome upon the four hundred or so delegates and their friends. The special train for Chelmsford left Liverpool Street Station early in the afternoon, and within an hour the small army of ladies and gentlemen of all nations were landed within a few minutes' walk up a country lane at the newly completed works of the Marconi Company. The rapidity with which these works have been constructed and everything brought into order was generally commented upon. It was only early in this year that it was decided to erect the premises owing to the great expansion of business which has taken place, the original factory, which was acquired by the Company in 1898 for the manufacture of the apparatus of Mr. Marconi's patents, although enlarged from time to time, having proved too small for the demands upon it. Ten acres of land alongside the railway were acquired, and the ground pegged out on February 10th last, bricklaying being commenced six days later.

*Group of Delegates and Friends at the Marconi Works, Chelmsford, on Saturday, June 22.*

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Early in May the buildings, floorings, and pipings were practically completed. There was certainly little to indicate that the new works were just being opened beyond the newness of the handsome building, the freshness of the paint and woodwork, and the extraordinary cleanliness. The workmen were busily engaged in their various operations, and the visitors were afforded every facility for inspecting the processes being carried on at Chelmsford. In the grounds were to be seen complete portable wireless stations, including a motor-car station, from which an operator got into communication with Hendon Aerodrome. During the afternoon a demonstration of transmission and reception was made between Poldhu and the new works, communication being maintained by means of a 15-kw. ship set, which was installed on the showroom to the main aerial from a tubular mast. This set gave a musical note of 400 cycles per second, and by means of change-over connections on the condenser bank and jigger primary, and the corresponding change of jigger secondary and aerial tuning inductance, allowed transmission to be effected on a range of wave-lengths from 600 to 2,800 metres.

Mounted against the north wall of the showroom was a standard 5-kw. battleship set. This had a spark note of 280 per second, and a very wide range of wave-length adjustment, which was obtained rapidly by changing over the plug condenser connections and the plug jigger primary connections. There was also shown a valve receiver, having a range from 600 to 1,600 metres, which, by means of an additional tuning-box, could be extended to 3,000 metres. Two 3-kw. sets were shown, one with a spark note of 700 per second and the other 400 per second. The feature of the second set was that it provided a quick change over by means of a suitable switch in the high-frequency primary circuit and aerial circuit from one wave-length to another. The complete transmitting plant of a 1½-kw. ship set was shown in a cabin specially designed for this class of work, and in another part of the showroom there was on view a new ½-kw. cargo set. The latter is extremely compact, and its circuits are designed to take the smallest space permissible consistent with sufficient insulation for the power and wave-lengths used. In order to economise floor space the high-speed motor converter runs vertically with a horizontal disc on the top of its shaft extension, which provides a note of 300 cycles per second.

One of the demonstrations which attracted considerable attention was the photographic recording apparatus, which worked with complete success throughout the afternoon. The visitors returned to London by special train, and later in the evening reassembled in the Savoy Hotel to a banquet given by the Marconi Company. The gathering that night was one of great brilliance and animation. The speeches were few and brief. Mr. Marconi, in a speech delivered in French, said that for the first time since the invention of wireless telegraphy representatives of every country in the world had assembled in London for the discussion of the revision of the international regulations governing the application of this discovery. This was for him personally a great honour, and it was a satisfaction to him to have received them at the works of the Company at Chelmsford that afternoon and to have met them during the evening. In his name and that of his colleagues he thanked the guests for their presence, and proposed the health of the delegates. Herr Koehler (Germany), Professor Battelli (Italy), Dr. A. J. Webster (United States of America), and Captain Cecil Norton, M.P., Assistant Postmaster-General, all fittingly eulogised Mr. Marconi's marvellous achievements. Mr. Bredow proposed the toast of Mr. Godfrey C. Isaacs, the managing director of the Marconi Company, who, in returning thanks, said a great deal of the success of the organisation which Mr. Bredow attributed to him was due to the great knowledge and example of that gentleman himself. The surprise of the evening was the presentation to every lady and gentleman present of a souvenir —to the ladies in the shape of a silver scent flask, and to the gentlemen a model of a Marconi disc discharger, which was the first means of producing musical notes in the transmission of wireless telegrams—the musical notes which one delegate compared to the opening notes of a symphony by Beethoven. The models were packed in handsome leather cases, and the tiny wheels, on being turned, produced sufficient spark to light a cigar or cigarette.

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The question of employing ladies to act as relief operators on liners has recently been alluded to in the Press. That women have not been employed in this capacity has nothing to do with efficiency; it would be a physical impossibility for women to do such work. The life of an operator at sea is scarcely a suitable one for a woman.

◆

A popular novelist, in one of her latest works, states that wireless telegraphy and light rays were familiar to the Egyptian priests and to that particular sect known as the Hermetic Brethren, many of whom used "violet rays" for chemical and other purposes. Wireless telegraphy was an ordinary method of communication between them, and they had their "stations" for it in high towers on certain points of land as we have now.

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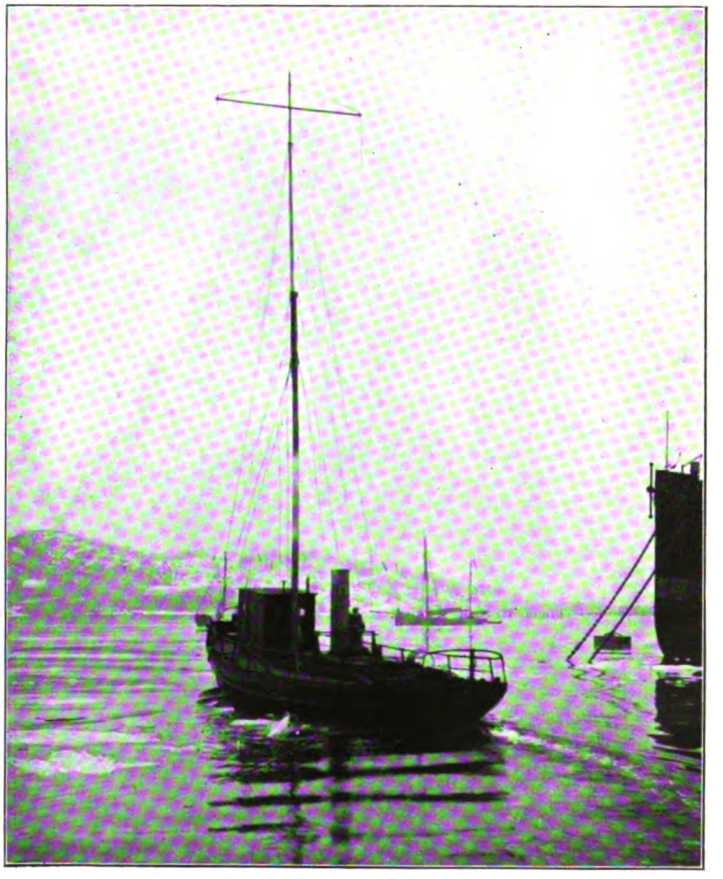
# Wireless on a 5-ton Motor-Boat

*(From a Correspondent)*

WHEN in Gothenburg, Sweden, some little time ago, a small motor-boat, named "Max," put in an appearance in the harbour. I was agreeably surprised to find that this little vessel was fitted with Marconi apparatus for wireless telegraphy. I believe that the "Max" is the smallest boat thus fitted. She is a 5-ton vessel, driven by a 35 horse-power engine, and running three miles an hour. The boat is owned by herring exporters, and her business is to follow the fishing fleet from 20 to 25 miles to sea, and to communicate to the shore news concerning "catches." When I saw the boat the Marconi apparatus was installed for the purpose of demonstrating to the owners the possibility of establishing communication between the boat and the shore at a distance of 20 miles. The only available space on board in which to install the apparatus was the wheel house. The installation consisted of a coil, condenser, and N.F. jigger, electrical energy being supplied by a battery of eight accumulators. The most difficult question to solve in connection with the installation was that of obtaining a suitable aerial, the boat having only one mast. This mast was increased approximately 16½ feet in height, but the enlarged mast was broken in the gale when the motor-boat went out on a trial trip on the day after the installation of the apparatus. Then a new and stouter mast was provided, and immediately the aerial was fitted, signals were exchanged with the Gothenburg station. The aerial was of the umbrella type, consisting of six wires—two wires leading to the fore, two aft and down to the roof insulator, and the remaining two straight down. The receiving wave-length of the Gothenburg station is 60 metres, and as the wave of the "Max" was only 300 metres long, it was necessary to insert a condenser in series with the aerial at the Gothenburg station. Signals were exchanged with the Gothenburg station over a distance of 30 miles, these signals being declared by the telegraphist on the shore station to be strong and clear. The owners of the boat made frequent use of the wireless facilities, and the traffic during the week of demonstration reached a total of about 800 words. Here is a striking illustration of the adaptability of wireless for small craft, such as fishing vessels and tugs.



*The Motor Boat "Max" Showing Wireless Aerial*

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# The Pacific as a Field for British "Wireless" Enterprise

**By J. W. O. Hamilton, F.R.G.S.**

THE Pacific Ocean is by far the largest of the water divisions of the world. Its vast area is studded in many parts with islands and archipelagoes, most of them beautiful, fertile and romantic. Columbus was the first to bring to Europe news of the existence of a great ocean between America and the East Indies. In 1520 Magellan, after passing through the famous strait which now bears his name, sailed into it, and finding its waters calm as a halcyon sea named it the Pacific. He made his way across it to the Phillipine Islands and perished there, the first navigator of an ocean the wealth of which as yet, comparatively speaking, remains unexploited, and which is even now imperfectly explored. Sir Francis Drake is said to have been the first Englishman to sail upon its waters—in 1577. For almost 300 years after its discovery very little was done by the British nation to explore the valuable lands of this part of the world. Had England fifty years ago chosen to pursue an energetic policy of annexation she might have had the whole of the Pacific territory, excepting the East Indian Islands, paying allegiance to her flag. In very recent years the whole of New Guinea, the New Hebrides and the Hawaian Islands might have been ours, but that Britain at this time was indifferent or, perhaps, unselfish. The great commercial and strategical possibilities of the Pacific Islands were lost sight of by our own people, and thus three other great nations—viz., the German, French and the American—have become firmly established among these scattered islands. Germany in particular has been most persistent in making her footing good, and has secured for her people the following valuable possessions—viz., Kaiser Wilhelm Land in New Guinea with its dependent islands of the Bismarck Archipelago, the largest of the Samoan Islands, the Caroline, Marshall, Pelew, and Marianne groups of islands. France comes very close to Australia in her possession of New Caledonia and the Loyalty Islands, and also shares control of the New Hebrides with Great Britain. In the Eastern Pacific France has annexed the beautiful Society Islands, the Pamotu and Gambier groups, the Leeward and Marquesas Islands. The United States in quite recent years annexed the Hawaian or Sandwich Islands, as well as Tutuila in the Samoan group.

*King George II of Tonga.*

Public opinion has changed since the days when our isolated dependencies in the Pacific were looked upon as an encumbrance to our nation rather than as a source of wealth. It is dimly foreseen to-day that the centre of the world's action may sometime be changed from Atlantic to Pacific waters. The awakening of the Eastern nations and the opening of new mail and trade routes by the cutting of the Panama Canal are important factors which

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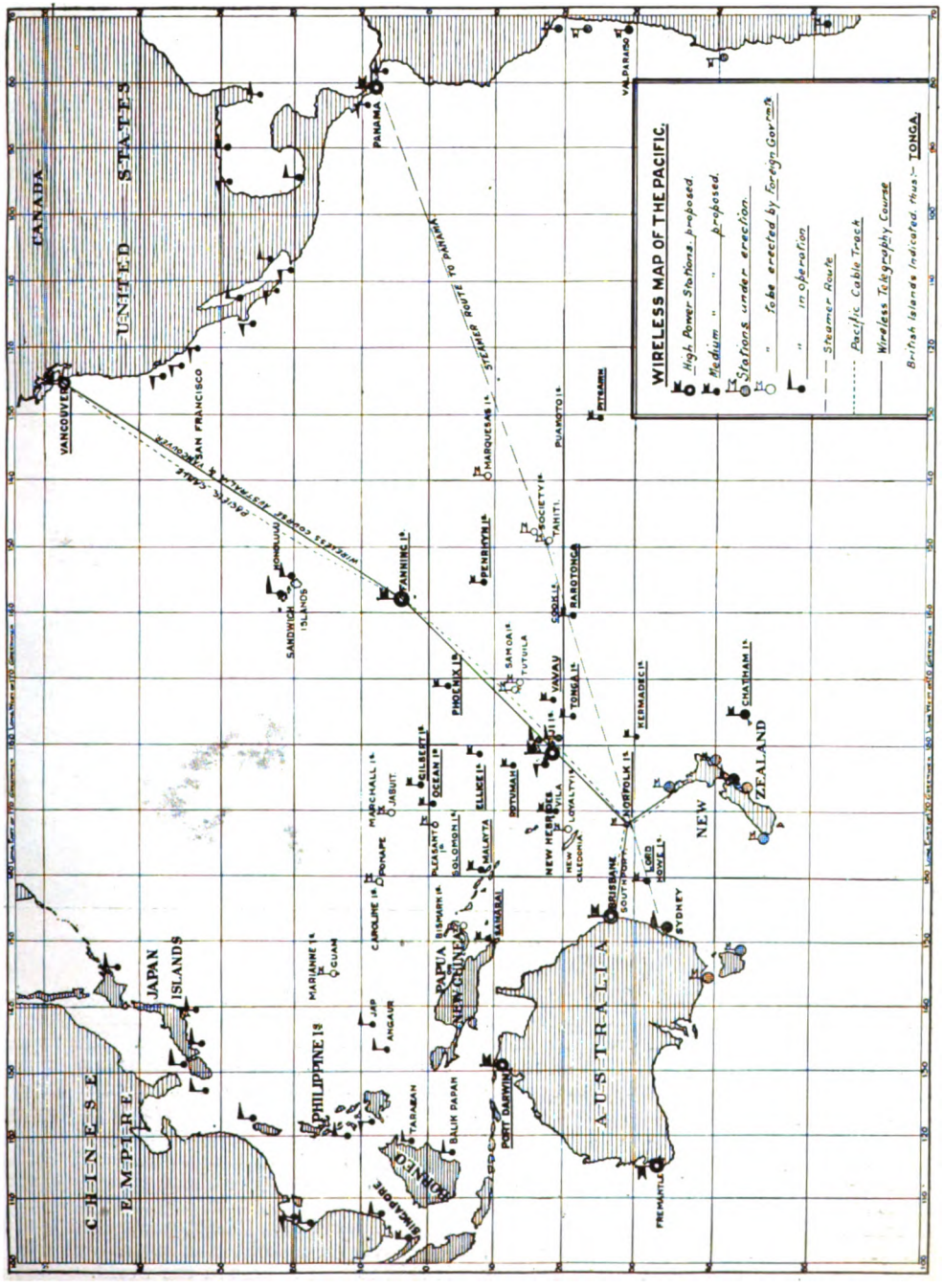


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must not be lost sight of in the development and protection of the nation's interests in "Greater Britain beyond the Seas."

The British interests are chiefly centred in the Fiji group, Papua or the South-east part of New Guinea, the New Hebrides, the Solomons, the Gilberts, Norfolk and Lord Howe Islands, the Tongan and Ellice groups, the Union and Phœnix groups, Cook and Kermadic Islands, the Chatham and Auckland Islands, the Santa Cruz Islands, Ocean, Washington and Fanning Islands. Many of the Pacific Islands are famed not only for their unique beauty, but also for the richness of their resources. They are extremely fertile and well watered, and on some of them minerals and phosphates of great value have been discovered. The principal exports are sugar, copra and beche-de-mer, pearls and pearl shells, nickel ore, and phosphates. Copra, the chief production of many of the islands, is the dried kernel of the cocoanut. It is a very profitable crop, and a cocoanut plantation once established is estimated to bear well for 100 years.

Beche-de-mer, called by the Chinese "trepang," is largely exported to China, where it is considered a great delicacy, and is worth from £80 to £100 per ton. It is found in lagoons, and has the appearance of a great slug or leech, and lives by suction upon the microscopic animalculæ so plentiful in tropical waters.

The climate of most of the Pacific Islands is probably the healthiest to be found in the tropics. The surrounding ocean and steady trade winds keep the temperature at a comfortable figure the whole year round. The quiet peacefulness which pervades everywhere, the lovely blueness of the sky and sea and the splendour of the foliage all tend to make them, as they are often called, and truly so, "Gardens of Eden." No words can paint the colouring and scenic charm of these reef-surrounded oceanic islands, whether they are of the high volcanic type or of pure coral formation. The wonderful beauty of their marine life and vegetations defies adequate description. The lagoons generally found on these islands are most fascinating. The water in them is of so great a transparency that an object the size of a man's hand may be seen distinctly in calm weather at a depth of 60 feet. The aspect at the bottom is that of a wilderness of marine vegetation of the most wonderful form and colour. Amongst all this are to be seen great multitudes of fish of extraordinary shape and hue—gold, purple and violet, scarlet, jet black, mottled, and every shade of green. These fish can be seen on any calm day in the holes of the reefs at low tide. The Aquarium at Honolulu has a very fine collection of tropical fish, and is said to be the best in the world.

Most of the Pacific islanders are tall and handsome, of a light-brown colour, sweet-eyed, docile, hospitable, and exceedingly

*Samoan Houses.*

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courteous. Friendly to all, they are generous to the poorest and least attractive stranger; food is free to anyone, for Nature provides far more in most places than life requires.

It is hard to realise the marvellous change that has come over many of the island people through the influence of education and civilisation. Within less than a generation some of the tribes were the fiercest cannibals known. The gentle old white-haired men still to be met with in Fiji were man-eaters in their younger days. In the more remote parts of Papua, the Solomons and New Hebrides the merry, fuzzy-headed, copper-skinned, almost barbaric islanders may still be seen in their native surroundings; generally naked to the waist, and with hair combed out and dyed a glaring yellow, they present a remarkable sight to the visitor.

The future of the Pacific Islands is a British responsibility. Geographically and commercially most of Oceania in the South Pacific should look to Australia and New Zealand for its markets, but with the exception of Fiji the fund of wealth lying untouched has been almost ignored. Throughout the Great Pacific the British are regarded by the natives as their protectors, and look to us for help in developing their lands. That help could be handsomely repaid. The national and commercial importance of these islands cannot be overestimated, especially in view of the position of many of them, lying as they do on the future direct route between Australia, New Zealand and Europe, via the Panama Canal. Other nations are awakening to commercial activity. In the determination to let no opportunities slip through their hands, Germany, France and the United States have given liberal subsidies to steamship lines to encourage development of their Pacific Island trade. Germany has spent freely in establishing cable and wireless services with her chief centres of island government.

The mainspring of the trade and development of a country is quick communication. The Pacific Islands depend chiefly upon slow and infrequent communication by shipping. Local enterprise is doing much to improve matters in this respect, but it has now been found imperative that some means of telegraphic communication should be established between the outside world and the chief centres of trade and government, not only on account of the advantages which such a service must afford to the commercial interests and development of the islands, but for the preservation of life and property, the administration of government, and for protection in case of war. At the present time steamers crowded with passengers make the voyage through the Pacific, and are away from all means of communication for from 14 to 28 days. Within very recent years a large mail steamer was wrecked on one of the outlying islands, and the passengers and crew suffered great hardships for months before rescue came, as there were no means of communicating with the search parties on adjacent islands.

There is one way by which efficient telegraphic communication can be rapidly and inexpensively established throughout the vast and isolated Pacific. This ocean, with its islands rising here and there as fruitful stations for man's habitation and industry, forms an almost ideal sphere for the application of "wireless" as the one practical means for communication with shipping and the chief centres of government and trade in our various possessions. Germany has already in hand a scheme for linking her own islands together with a system of wireless telegraphy which will be coupled with the telegraph system of the world through the American cable at Jap. Other countries bordering on the Pacific have established a large number of stations. Installations are now in operation in the Philippines, Hawaian Islands, Japan, China, Dutch East Indies, and all along the coast line of America from Alaska to Terra del Fuego. Australia and New Zealand are installing a number of stations, while England has three small ones in operation in the Fiji Islands. The writer commends the accompanying chart to the notice of readers. An inspection of it will convey some idea of the importance of establishing wireless communication with our isolated possessions in the Pacific. By establishing high-power stations at Vancouver Island, Fanning Island, Fiji, New Zealand and Australia to link up with the imperial chain of wireless stations at Singapore our chief outposts in the Pacific would be brought into constant touch with the centres of administration and the markets of the world. If the medium-power stations, as indicated, were installed on the lesser islands, communication could be maintained between each and all of them as required, and also with the imperial chain and passing shipping. From the point of view of linking together the isolated parts of the Empire, in the interests of our commerce, the maintenance of our prestige in the Government of these far-off lands and seas, the preservation of life and property, and for the protection of our own people in time of war, the value of wireless telegraphy cannot be over-estimated. By its aid we should be in constant touch with the many passenger steamers and warships that traverse Pacific waters. It is not too much to say that increased settlement and commerce will surely follow in the wake of such a system of communication.

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THE MARCONIGRAPH

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The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

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**BINDING CASES** for "The Marconigraph," Vol. I., are now on sale, price 1/6 each post free. Applications with remittance to be made to The Publisher, Marconi House, Strand, London, W.C.

**PORTRAIT OF MR. PHILLIPS.** The Publisher begs to announce that he has arranged to supply portraits of the heroic Marconi Officer who lost his life as a result of the "Titanic" disaster at the following prices: Cabinet size, 1/9 each; Enlargements, 10 in. by 8 in., 13/-; 12 in. by 10 in., 14/-; 15 in. by 12 in., 17/6 post free. The portrait is by Miss J. Stedman of Farncombe, and is the same as that from which the illustration in the May number of THE MARCONIGRAPH was made.

### The Share Market

The market during the past month has been a very busy one. A settlement has taken place in the new issue of shares of the Marconi Wireless Telegraph Company of America. In spite of the enormous volume of business since their introduction on the London market, the settlement passed off most successfully. The market in the various issues is now a very healthy one, and there is a steady demand for all classes of shares on an investment basis. On Saturday, June 22nd, a large and distinguished gathering visited the new works at Chelmsford at the invitation of Commendatore Marconi, and witnessed a highly interesting demonstration of the transmission and reception of wireless messages. The efficiency of the system and its immense possibilities were apparent to every one present. The closing prices of the various issues on June 24th were as follows: Ordinary, $6\frac{1}{16}$; Preference, $5\frac{5}{16}$; New, 6; Canadian, 25 3; Spanish, $1\frac{5}{16}$; American, $1\frac{3}{16}$.

### The Phillips Memorial Fund.

The fund which has been opened for the establishment of a memorial to the gallant Marconi operator, Mr. J. G. Phillips, who was one of the victims of the "Titanic" disaster, is meeting with a great deal of support. The promoters of the fund are the public authorities of the county of Surrey (with Viscount Midleton, the Lord Lieutenant of the county, at the head) and the Municipality of Godalming. The sum of £500 is required for the purpose of the memorial, and £300 has already been subscribed, including a donation of fifty guineas from the Marconi Company. In acknowledgment of the latter donation the Mayor of Godalming wrote as follows:

> "Please convey to your directors my grateful thanks for their promised splendid donation. Up till now we have received about £300, and I am glad to be able to say that we continue to receive subscriptions daily. We shall require at least £500 to carry out our proposed scheme, and I and my colleagues will be grateful for any assistance on the lines suggested in your letter. Again expressing my grateful appreciation for your kindly interest and support.
>
> "Yours, etc.,
> "E. BRIDGER,
> *"Mayor."*

There are many of our readers who will be glad to have the opportunity of subscribing towards this fund, and we feel sure that the appeal which is addressed to them by the Mayor of Godalming will meet with a generous response. Although more than half the amount required has already been subscribed, a great

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deal is still necessary to enable a fitting memorial to be established to Phillips, whose heroism is an inspiriting example to the service, and ranks with the noblest deeds of gallantry performed at sea. We appeal to all telegraphists, both in this country and abroad, as well as to our readers all over the world, to support the fund which has been opened, and any donations sent to the Editor of THE MARCONIGRAPH will be forwarded to the proper quarter.

### The O'Driscoll Fund.

Mr. R. O'Driscoll, who was the operator in charge of the Clifden station, died recently at the early age of 35, leaving behind him a widow and three young children totally unprovided for. At the suggestion of several of the late Mr. O'Driscoll's colleagues, it has been decided to open a fund for the purpose of granting some relief to the widow and family in their present unfortunate circumstances, and of enabling them to make provision for their future. The case is one deserving of sympathy, and we appeal to members of the staff to accord it their generous support. Contributions may be sent to the Editor of THE MARCONIGRAPH.

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### Marconi Patents in America.

The Marconi Wireless Telegraph Company has received a telegram from New York advising that the Boston Court of Appeals has delivered judgment against the National Electric Signalling Company with costs.

This judgment allows of the immediate transfer of the title of the assets of the United Wireless Telegraph Company to the Marconi Company, and it is expected that the arrangements for the passing of title to the Marconi Company will be completed this week.

### Extension of News Service to Canadian Vessels.

A further extension of the news service to vessels by wireless has to be recorded, this extension involving the inclusion of Canadian vessels in the Gulf of St. Lawrence. All land stations on the Gulf receive daily a Press bulletin of some seventy or eighty words, and this message they transmit to all vessels within range. Inward bound steamers receive a message, on reaching Cape Ray or Belle Isle, of some two hundred words, comprising the last three days' bulletins, and for the rest of the voyage are in touch with one or other of the land stations. Outward bound boats receive the news daily as they pass the stations. This service, which has been inaugurated by the Marconi Wireless Telegraph Company of Canada, Ltd., is a useful extension of the Marconi news service system, and still further increases the ability of one fraction of the world to know what the remaining parts are doing.

### Wireless Map of the World.

There has long been felt a need for a map showing the location of wireless stations throughout the world. The Marconi Wireless Telegraph Company have applied themselves diligently to the production of such a map, which has just been published. The map is on a large scale—40 by 24—and the stations are very clearly shown. Where a large number of stations are located within a comparatively restricted area, such as Western Europe, the Atlantic Coast of America, the South-Eastern District of Canada and the Mediterranean District, insets on a larger scale are provided.

### Wireless and Industrial Unrest.

"The unrest of the national transport workers has awakened public interest in any proposal that will lead to a mitigation of the annoyances and anxieties of such a crusade in future. Wireless telegraphy seems to afford one means of alleviating the position. It has been decided by a number of shipowners trading with London and our large ports, where especially food and other urgently needed supplies are handled, that the installation of a compact wireless telegraph equipment on board ships of small tonnage will help to relieve an undesirable situation. Communication with the shore stations now available will help to divert traffic to such ports as are not disturbed by labour upheavals, which seem to arise without rhyme or reason, and would probably peter out much more rapidly if this means of communication between ship and shore were more generally adopted than at present. There can be little doubt that if this means had been available during May and the early part of June, the strike fiasco, both national and local, would have come about even earlier than it has. The installation of these small sets is a work that is now going on rapidly."—*Electrician.*

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# Position and Prospects of the Marconi Company

## A Record Year—Future Developments Outlined

THE report for 1911 of the Directors of Marconi's Wireless Telegraph Co., Ltd., made its appearance on June 11th, and showed results very much in excess of those for 1910. Indeed, the results shown in that document may fairly be described as remarkable. So clearly are the Company's position and prospects outlined in the report that this must be our excuse for publishing the document *in extenso*, despite the widespread publicity it has gained through newspapers all over the world.

### Directors' Report

The Directors, in submitting herewith the Balance Sheet, together with Profit and Loss Account for the year ending December 31st, 1911, regret that it has not been possible to complete the accounts at an earlier date, which would have enabled them to convene a General Meeting prior to June 4th. Having to devote the whole of their time during this month to the International Radio-Telegraphic Conference, they are obliged to defer the meeting until July 9th. In these circumstances their report will deal not only with the business of the year 1911, but also with the important developments of the Company for the first five months of this year.

Your Directors have great satisfaction in confirming the circular which was issued to the Shareholders on March 7th last, informing them that they had brought to a successful issue a negotiation which has proclaimed to the world the great strides made in the development of wireless telegraphy and by this Company. That circular, it will be remembered, advised that satisfactory terms had been settled between His Majesty's Postmaster-General and the Company for the construction of all the long-distance wireless stations which will be required within the next few years for the Imperial Wireless Scheme. The importance to the Company of this agreement cannot be exaggerated, and 10 per cent. of the gross receipts of so important a commercial telegraphic service must represent to this Company a very considerable revenue for many years to come.

All the stations to be erected under this Imperial scheme will be fitted with the latest duplex invention of Mr. Marconi and also with apparatus for automatic transmission and reception, under which conditions the Company guarantees a speed of not less than 50 words per minute, which under favourable conditions should be considerably exceeded. All the long-distance commercial stations which the Company will be erecting in the future will be fitted with similar apparatus for automatic transmission and reception.

### The Year's Trading

During the year 1911 the Company's business showed further satisfactory extension, the gross trading profit having amounted to £214,407 1s. 4d. as compared with the sum of £127,452 13s. 1d. for the preceding year, and the net profit carried to the balance sheet was £141,717 7s. 1d., as compared with £60,513 0s. 3d. for the year 1910. But for the fact that the Company's business completely outgrew the capacity of its Chelmsford Works, delaying the completion until this year of much of the work pertaining to 1911, the above figures would have been even more satisfactory. It will be observed with satisfaction that the amount due from the Marconi Wireless Telegraph Company of Canada, Ltd., was reduced during 1911 from £163,865 18s. 5d. to £78,588 0s. 8d. This figure, however, is likely to be increased somewhat during 1912, as it is deemed preferable that this Company should render for the present the financial assistance which is required by the Canadian Company for its development.

In the Balance Sheet "Patents and Shares in Associated Companies" are again taken into account at their cost price, with the exception of Spanish shares, which are taken at their par value. The Company's shareholdings have been reduced by the sale of 50,000 Canadian shares at 15s. per share, and the redemption by the International Company of £40,000 debentures at par, and increased by the addition of Spanish, Russian and French shares. The Company now holds shares in associated companies of a total par value of £2,074,723 11s. 9d., many of which are quoted at a premium.

On October 25th last a resolution was passed at an Extraordinary General Meeting of the Company authorising the increase of the capital by 250,000 Ordinary Shares of £1 each. These shares were issued at £1 per share premium, of

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which £99,072 5s. was paid during 1911, the balance falling due on or before June 1st, 1912, thus increasing the Premium Account to the end of 1911 to £105,702 10s. 2d., which figure in the next balance sheet will be increased to the sum of £256,630 5s. 2d. In so far as it was practicable and to the extent of three-quarters of the issue these shares were offered to the shareholders; the remaining 25 per cent. were dealt with at the same price and served to guarantee the issue without cost to the Company.

The acquisition of the patents of the Lodge-Muirhead Syndicate has further strengthened the Company's patent position.

In October last the control of the Russian Company of Wireless Telegraphs and Telephones was acquired. This Company possesses extensive freehold works in St. Petersburg, and, under the able managing direction of Mr. Adrian Simpson, is conducting a very extensive and continuously increasing business. There is every reason to expect that that Company will commence to pay substantial dividends in the early future, and will take a prominent place amongst the affiliated companies.

The Compania Nacional de Telegrafia sin Hilos has completed its first chain of stations, and a further number will be erected as soon as the Spanish Government have approved of the sites selected. A considerable telegraph business is being conducted between Spain and the Canary Islands, and also with ships at sea. As soon as the necessary arrangements will have been completed it is intended to open up the service between the Canary Islands, Spain and this country, and further extensions of the service will follow.

Recently your Chairman and Managing Director paid a visit to Madrid, and were received in private audience by His Majesty the King. His Majesty bestowed the honour of the Grand Cross of the Order of Alfonso XII. upon Mr. Marconi.

The Company entered into an engagement to obtain a quotation and settlement in the shares of the Compania Nacional de Telegrafia sin Hilos. Owing, however, to the difficulties which arose through the shares of the Company being of 500 pesetas each, it was arranged that a company entitled "The Spanish and General Wireless Trust, Ltd.," should be formed, enabling those who so desired to convert their shares in the Spanish Company into shares of £1 each in the Trust Company, which would facilitate the fulfilment by the Company of its obligations. The new Company was accordingly registered in the early part of this year.

The Belgian Company has declared a dividend for the year ending December, 1911, amounting to 50 francs per capital share (10 per cent.) and 24 francs per Founder's share.

The French Company has declared a dividend for the past year at the rate of 5 per cent. per annum.

The Marconi International Marine Communication Co., Ltd., whose business continues to show extensive development, is about to declare a dividend at an increased rate for the year ending December 31st, 1911.

The Deutsche Betriebsgesellschaft fur Drahtlose Telegraphie m.b.H. (Debeg), which conducts the mercantile marine business in Germany, and in which this Company is interested through its Belgian Company, has declared its first dividend of 4 per cent. for the year ending September 30th, 1911.

The Marconi Wireless Telegraph Company of Canada continues to show satisfactory progress. Negotiations for a further contract with the Government have been pending for some time. We are informed that the terms have now been practically agreed, and the contract is likely to be executed at an early date.

Circumstances have delayed somewhat the proposed developments of the Argentine Company. A representative of this Company, however, is now in Buenos Aires with a view to making arrangements which will enable that Company to make rapid progress in the future.

**Important Developments in America**

Progress of the greatest importance has been made in the United States of America. For some years past the American Company was able to transact but a comparatively small business owing to the severe competition to which it was submitted by the United Wireless Telegraph Company. The business methods adopted by that Company were such as to render effective competition impossible unless business were to be conducted at a substantial loss. There was, however, no doubt that the United Wireless Company was infringing the patents of this Company, and proceedings at law were therefore commenced. Your Chairman and Managing Director proceeded to New York, accompanied by Mr. James Swinburne, F.R.S., to give evidence on behalf of the American Company, the case having been fixed by the Judge to be heard on March 25th. Following the prosecution and subsequent conviction of the Directors of the United Wireless Telegraph Company the business was being conducted by Trustees under the Court, pending the completion of the arrangements which were in course by a Shareholders' Re-organisation Committee. As a result of negotiations between the Trustees, the Shareholders' Committee and this Company, agreements were eventually entered into by which this Company acquired the whole of the tangible assets both in and out of the United States of the United Wireless Telegraph Company. These assets in so far as they related to the United States of America

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were re-sold to the Marconi Wireless Telegraph Company of America. The United Wireless Telegraph Company acknowledging the validity of the Marconi patents, and admitting the infringement, judgment and a perpetual injunction were granted by the Court. The business is now being directed by the Marconi Wireless Telegraph Company of America, and for their account as and from March 31st last. Arrangements are in progress for the transfer to this Company of the property out of the United States of America possessed by the United Wireless Telegraph Company, and judgment by consent in favour of this Company will be taken in the actions pending against the United Wireless Telegraph Company in our High Courts of Justice.

**Ship and Shore Business**

The satisfactory ending of this litigation together with the acquisition of the tangible assets of the United Wireless Telegraph Company is deemed by your Directors to be of the greatest importance. It should at once convert the business of our American Company into one of considerable magnitude, controlling all the coast stations of importance on both the east and west coasts, besides practically the whole of the American Mercantile Marine at present fitted with wireless telegraphic installations. It may be reasonably anticipated that this business alone should prove sufficiently remunerative to enable the payment of dividends even upon the largely-increased capital. A considerable impetus, however, to the ship and shore business in the United States is to be expected from recent events by the extension of the scope of the existing law rendering wireless telegraphy compulsory upon practically all vessels.

During the visit of your Chairman and Managing Director to New York a further agreement of great significance and importance was entered into with the Western Union Telegraph Company and the Great North-Western Telegraph Company. This agreement *inter alia* furnishes the Marconi Company with some twenty-five thousand telegraph stations for the delivery and despatch of Marconigrams throughout the United States and Canada. It is no doubt well known to shareholders that in the United States of America the telegraph service is not carried on by the Government as is the case in other countries, but is in the hands of private companies, mainly of the Western Union Telegraph Company, with whom also is associated the telephone service. The American continent represents a very important proportion of the telegraph business of the world, and therefore a considerable link in the chain of stations round the world which forms the more important programme of the future of this Company. In order to create an efficient telegraph service it was essential to this Company either to have the benefit of such an immense organisation as that of the Western Union for the purpose of the receipt and delivery of its messages, or to itself create an opposition service. One or the other was necessary before it would be possible effectively to create long-distance services between this country and New York, the Pacific coast and the East, and between North and South America. The agreement now entered into enables this Company in conjunction with the American Company immediately to embark upon the erection of the stations which will open up by wireless improved and cheaper telegraph services to all these parts of the world, fulfilling an important section of this Company's programme.

**Capital Increase**

The stations to be constructed by the American Company necessitate a large expenditure. It was, therefore, resolved to increase the capital of the American Company to $10,000,000, and to split the existing shares of $25 into shares of $5 each. Resolutions to this effect were passed by the American Company on April 18th. By the laws of the State of New Jersey, under which the American Company is registered, any increase of capital must in the first instance be offered to shareholders. It was not contemplated that the shareholders would have taken more than a small proportion of the total number, and this Company had undertaken to place whatever number of shares there remained unsubscribed. The importance, however, of the contracts entered into with the Trustees of the United Wireless Telegraph Company and with the Western Union Telegraph Company were so well appreciated in the United States that an excited market prevailed for the old $25 shares, which were purchased at many times their face value in order to secure the right of application for the new shares, the whole $7,000,000 of which were applied for by the shareholders or those who had purchased rights. Thus the total sum of $7,000,000 was subscribed in cash, and is available for the construction of a large number of stations and the development of a very extensive telegraph service.

Arrangements are now in progress, and the work will be carried out as expeditiously as possible, for the construction of stations placing this country in direct communication with New York, instead of as at present passing through our station at Glace Bay, for the construction of stations at San Francisco communicating through the Hawaiian Islands to the Philippines, China and Japan, and from New York south to Cuba, Panama, and sub-

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sequently with each of the South American States. Each of these stations when completed should ensure to the American Company, as well as to ourselves, a very considerable revenue.

The United States having now adhered to the International Radio-Telegraphic Convention, the conduct of business will be greatly facilitated, and irresponsible and troublesome interference caused by amateurs and others in the past will now cease.

**Contract with the Portuguese Government**

An important contract has recently been entered into provisionally with the Portuguese Government, at whose invitation your Chairman and Managing Director recently paid a visit to Lisbon. Your Directors are not prepared at this moment to give fuller information in respect of these matters, but hope to be in a position to do so at the General Meeting.

The Coltano (Italy) long-distance station was opened in December of last year, and is working most satisfactorily with the Italian Colonies on the East Coast of Africa.

A number of important negotiations are pending with many foreign Governments, which it would be premature to refer to further at this juncture.

The Transatlantic service has continued to work satisfactorily. From May 1st of this year all the postal telegraph offices throughout the United Kingdom have been opened for the reception of messages "*via* Marconi" to any part of the United States of America and Canada. The Company has now the use of a private line from eight at night until eight in the morning, by which it is able to send its messages directly from its office in the Strand to the Clifden Station, thus materially curtailing the delays which occur on the land lines. It is hoped that the use of a private line in the daytime will be obtained shortly. There has been a considerable increase in the number of commercial messages and in Press work, many thousands of words being despatched every day from London to the New York Press.

**Transatlantic Wireless**

The general public are now beginning to realise that it can send its messages to America and Canada by wireless at 4d. per word less than by other systems. When the land lines were clear the *New York Times* received in their office in New York messages sent over our system from London within ten minutes of the time of their despatch. When the new stations between London and New York are complete they will be independent of the land lines and will provide a service which will not be surpassed in speed or accuracy.

The successful development of your Company has not unnaturally brought into prominence a large number of inventions and patents in connection with wireless telegraphy, most of which, if not all, are first offered to this Company. A staff of able engineers under the direction of Mr. Marconi are employed in examining carefully every patent specification which has any connection with wireless telegraphy, and a practical test is made of every device or system for which patent application is made or which is submitted to this office. The Company makes a point of keeping itself very well informed in these matters, and is at all times prepared to pay reasonably for anything new and of value which comes to its notice. It has entered into arrangements by which it obtains the sole rights of the world of a process invented by Messrs. Bellini & Tosi, and which is known as the wireless compass. This is an invention which with certain improvements introduced by the Company's engineers should prove to be of considerable value. It will be worked in conjunction with existing wireless telegraphic installations on board ships, and will define the position of an approaching ship or of land in a dense fog, thus eliminating a further danger, and perhaps one of the greatest to which navigation is subjected. Active steps are now being taken for the commercial development of this process. Since our last report further valuable patents tending to further perfect wireless telegraphy have been applied for by Mr. Marconi on behalf of this Company.

The recent terrible catastrophe upon the Atlantic Ocean has again brought prominently before the notice of peoples of all nationalities the immense value of Mr. Marconi's invention and the necessity of its more general use by ships at sea. Whether or not wireless telegraphy should have saved every soul on board the "Titanic" will probably be known when the Board of Trade inquiry will have been concluded. In the meantime, however, it is but reasonable to suppose that a number of vessels could have been called to assistance had they had a wireless installation on board, and therefore have been capable of receiving the terrible news instead of continuing on their way ignorant of the tragedy which was taking place within perhaps a short distance of them. There can be little doubt that this terrible catastrophe brings us nearer to the day when ships of every nation will be compelled to carry this greatest life-saving apparatus.

**Tapping of Messages**

It may not be out of place here to refer to the general fallacy of which one has heard so much in recent times respecting the so-called tapping of wireless messages, and to remind

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## Dr. BALANCE SHEET,

| | £ s. d. | £ s. d. | £ s. d. |
|---|---|---|---|
| To Capital— | | | |
| *Authorised.* | | | |
| 750,000 Ordinary Shares of £1 each ... ... | 750,000 0 0 | | |
| 250,000 7 per cent. Cumulative Participating Preference Shares of £1 each ... ... | 250,000 0 0 | | |
| | £1,000,000 0 0 | | |
| *Issued.* | | | |
| 508,266 Ordinary Shares of £1 each, fully paid ... ... ... | | 508,266 0 0 | |
| 241,734 Ordinary Shares of £1 each, partly paid ... ... ... | | 30,269 5 0 | |
| 250,000 7 per cent. Cumulative Participating Preference Shares of £1 each fully paid ... ... ... ... ... ... ... | | 250,000 0 0 | 788,535 5 0 |
| ,, Share Premium Account ... ... ... ... ... ... | | 256,630 5 2 | |
| *Deduct* Amount receivable in 1912 ... ... ... ... | | 150,927 15 0 | 105,702 10 2 |
| ,, Sundry Creditors, including Bills Payable ... ... ... | | | 59,473 11 1 |
| ,, Reserve for Expenses Unpaid and Payments in Advance on Account of Contracts and Royalty ... ... ... ... | | | 17,628 2 1 |
| ,, Profit and Loss Account— | | | |
| Balance as per last account, December 31st, 1910 ... ... ... | | 65,718 17 10 | |
| *Add* Balance of Account for the year ending December 31st, 1911 | | 141,717 7 1 | |
| | | 207,436 4 11 | |
| *Deduct* 7 per cent. Preference Dividend ... | £31,766 9 6 | | |
| ,, Ordinary Interim Dividends for 1911 | 49,896 5 0 | | |
| | 81,662 14 6 | | |
| *Less* Amounts paid February 1st, 1912— | | | |
| 7 per cent. Preference Dividend £8,420 5 10 | | | |
| Ordinary Interim Dividend 26,502 10 0 | | | |
| | 34,982 15 10 | | |
| | | 46,679 18 8 | 160,756 6 3 |
| To Contingent Liability on Shares in Associated Companies ... ... ... ... | £66,387 10 0 | | |
| | | | £1,132,095 14 7 |

## Dr. PROFIT AND LOSS ACCOUNT

| | £ s. d. |
|---|---|
| To Rents, Rates, Taxes, Travelling and General Expenses and Commission ... | 14,455 9 10 |
| ,, Salaries and Directors' Fees, including Managing Director's Remuneration | 33,010 9 2 |
| ,, Law Charges and Patent Expenses ... ... ... ... ... ... ... | 3,236 4 4 |
| ,, Depreciation of Plant, Machinery, Buildings and Furniture ... ... ... | 3,469 4 1 |
| ,, Foreign Agency Expenses ... ... ... ... ... ... ... ... ... | 1,042 12 6 |
| ,, Interest and Income Tax ... ... ... ... ... ... ... ... ... | 2,527 5 10 |
| ,, Station Expenses and Experimental Work ... ... ... ... ... ... | 15,780 4 3 |
| ,, Balance carried to Balance Sheet ... ... ... ... ... ... ... | 141,717 7 1 |
| | £215,238 17 4 |

## Report of the Auditors to the Shareholders.

We have audited the above Balance Sheet. The item, Patents and Shares in Associated Companies, as to the value Buenos Ayres, Madrid, and St. Petersburg. We have seen a letter from a Trust Company and from Solicitors stating that the Buenos Ayres we have seen a letter from the Banco de Italia y Rio de la Plata, stating that the certificates of the shares have seen a letter from the Banco de Castilla stating that the shares are held by them on behalf of the Managing Director of this shares are held by them on behalf of this Company. We have obtained all the information and explanations we have required, according to the best of our information and the explanations given to us and as shown by the books of the Company.

London, *June 8th*, 1912.

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## December 31st 1911.

Cr.

| | £ s. d. | £ s. d. |
|---|---|---|
| By Cash at Bankers and in hand ... ... ... ... ... | | 79,871 16 2 |
| ,, Loan Against Securities ... ... ... ... ... ... | | 40,000 0 0 |
| ,, Debtor Balances ... ... ... ... ... ... ... | | 198,426 17 0 |
| ,, Amount due from the Marconi Wireless Telegraph Company of Canada, Ltd. ... ... ... ... ... ... ... | | 78,588 0 8 |
| ,, Stock at Cost or Under as certified by the Works Managers ... | | 52,840 5 2 |
| ,, Freehold Works at Dalston ... ... ... ... ... | 39,480 16 0 | |
| *Deduct* Mortgage ... ... ... ... ... ... | 16,611 12 4 | |
| | | 22,869 3 8 |
| ,, Plant, Machinery and Buildings at Chelmsford Works ... | | 7,737 16 5 |
| ,, Long Distance Freehold Stations at Clifden, Ireland, and Poldhu, Cornwall, and Movable Plant at Other Places | | 139,217 18 11 |
| ,, Office Furniture and Fittings at Head Office, Chelmsford, Rome, and Genoa ... ... ... ... ... ... ... | | 4,020 8 7 |
| ,, Patents and Shares in Associated Companies— | | |
| 200,290 fully-paid shares of £1 each of the Marconi International Marine Communication Co., Ltd. ... ... ... | 200,290 0 0 | |
| 834,521 fully-paid shares of $5 each Series "A" of Cia Marconi de Telegrafia sin hilos del Rio de la Plata (Argentine Company) ... ... ... ... ... ... ... | 834,521 0 0 | |
| 88,250 shares of $5 each (25 per cent. paid) Series "B" of Cia Marconi de Telegrafia sin hilos del Rio de la Plata (Argentine Company) ... ... ... ... ... | 22,062 10 0 | |
| 34,174 fully-paid shares of $25 each of the Marconi Wireless Telegraph Company of America ... ... ... ... | 170,870 0 0 | |
| 504,855 fully-paid shares of $5 each of the Marconi Wireless Telegraph Company of Canada, Ltd. ... ... ... | 504,855 0 0 | |
| 250 shares of £1 each (20 per cent. paid) of the Marconi Press Agency, Ltd. ... ... ... ... ... ... | 50 0 0 | |
| 4,040 fully-paid Preference shares of Pesetas 500 each of Cia Nacional de Telegrafia sin hilos ... ... ... ... | 74,814 16 3 | 508,523 8 0 |
| 4,950 fully-paid Ordinary Shares of Pesetas 500 each of Cia Nacional de Telegrafia sin hilos ... ... ... ... | 91,666 13 4 | |
| 10,800 fully-paid shares of Roubles 100 each of Société Russe de Télégraphes et Téléphones sans Fil ... ... ... | 114,893 12 2 | |
| 175 fully-paid Ordinary Shares of Francs 100 each of Cie Francaise Maritime et Coloniale de Telegraphie sans Fil | 700 0 0 | |
| 90 Bearer Shares (Parts Bénéficiaires) of no capital denomination of Cie Francaise Maritime et Coloniale de Telegraphie sans Fil ... ... ... ... ... ... | — | |
| 100 Bearer Shares (Founders) of no capital denomination of Cie de Telegraphie sans Fil ... ... ... ... | — | |
| Total Par Value ... ... ... | £2,074,723 11 9 | |
| | | £1,132,095 14 7 |

## year ending December 31st, 1911.

Cr.

| | £ s. d. |
|---|---|
| By Balance of Contracts, Sales and Trading Account ... ... ... ... | 214,407 1 4 |
| ,, Transfer and Share Warrant Fees ... ... ... ... ... ... ... | 831 16 0 |
| | £215,238 17 4 |

G. MARCONI, *Director.*
S. FLOOD PAGE, *Director.*

of which see Directors' Report, includes shares of the par value of £1,686,662 11s 9d., which are deposited in Montreal, New York, certificates of the shares respectively in Montreal and New York are held on behalf of this Company. For the shares held at been deposited with them to the order of the President of the Argentine Company. For the shares held in Madrid we have Company, and for the shares held in St. Petersburg, we have seen a letter from the Banque de Commerce de Siberie stating that the In our opinion such Balance Sheet is properly drawn up so as to exhibit a true and correct view of the state of the Company's affair

COOPER BROTHERS & CO., *Chartered Accountants.* } *Auditors.*

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shareholders that, under the Berlin Convention of 1906, it was agreed by all the nations who are adherents to that convention that ships at sea must be at attention on a wave-length of 300 metres, and that conversations between ships at sea and coast stations shall be carried on by the use of wave-lengths of either 300 or 600 metres. The very object of this international law is that in case of distress or otherwise every ship at sea shall be capable of calling or being called by any other ship at sea or any coast station; thus every ship is necessarily able to overhear any other vessel or station within range. This, however, applies to ship communications only. Mr. Marconi's famous No. 7,777 patent enables stations to tune to any wave-length by simple means, and only stations tuned to the same wave-length can communicate together.

THE MARCONIGRAPH magazine, which was started by the Company in the early part of last year, has now developed into an important publication, with a continuously-increasing circulation. Its revenue already exceeds its expenditure, and it promises to become a property of value. Arrangements are in progress for its simultaneous publication in the United States of America, Russia and Spain.

**Chelmsford Works**

Owing to the continuous and considerable development of the Company's business, the Chelmsford factory has been kept at work night and day, but has proved totally incapable of coping with the continued increase of business. Your Directors have found it therefore incumbent upon them to purchase some 10 acres of freehold land close to the Great Eastern Railway, and erect thereon new works capable of the output which is required of them. The machinery is now in course of being installed, and it is hoped within a few days to be in full occupation.

Considerable difficulty was found in obtaining office accommodation under one roof to provide for the necessary staff in London, which has now been satisfactorily overcome by your Directors obtaining a 99 years' lease from the London County Council of what was the Gaiety Restaurant, but which is now known as Marconi House.

During last year interim dividends were declared at the end of June and the end of December amounting in all to 7 per cent. on the Preference Shares and 10 per cent. upon the Ordinary Shares. It is the intention of your Directors to recommend the payment of a final dividend of 10 per cent. for the year 1911, to which all classes of shares will be entitled. Subject to the approval by the General Meeting of the payment of this dividend it is the intention of your Directors to continue the policy adopted last year of declaring interim dividends pending the preparation of the balance sheet, and in view of the fact that the actual business in hand at this time last year was represented by orders amounting to £254,000, whereas to-day the amount considerably exceeds £1,000,000, your Directors feel that they will be adopting a sufficiently conservative policy in declaring 7 per cent. on the Preference Shares and a first interim dividend of 10 per cent. on the Ordinary Shares as against the 5 per cent. of last year, thus leaving Preference and Ordinary Shares to participate equally in all further distributions for the current year.

The Directors retiring by rotation are Major S. Flood Page, Mr. Henry S. Saunders and Mr. S. Geoghegan, who, being eligible, offer themselves for re-election. The Auditors, Messrs. Cooper Brothers & Co., also retire and offer themselves for re-appointment.

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A correspondent has communicated to the *Irish Times* a copy of the first wireless message between two vessels belonging to the Cunard line, which was sent when he was travelling home from New York in the "Lucania" in September, 1901. The following is a copy of the message published by the correspondent:

Campania: Are you there?

Lucania: Yes, here—Lucania.

Campania: Have you anything for us?

Lucania: Yes; Lucania sends best wishes for a pleasant voyage. All well.

Campania: All right. Thanks. Message for Captain McKay. Captain Walker sends his respects to Captain McKay. We have experienced very bad weather since leaving Liverpool. All well.

Lucania: Message received all right. Thanks.

Campania: Have you seen any ice, or have you experienced any fog, please?

Lucania: No; have seen no ice or experienced any fog. We have had fine, clear weather up to the present. What is your position now, please?

Campania: Let us have your position; we will get ours.

Lucania: Our position—latitude 48.15 N., longitude 38.39 W.

Campania: Thanks. Our position is latitude 48.50 N., longitude 38.29 W.

Lucania: 2.45 a.m.—Good-bye. Pleasant passage.

Campania, 2.50 a.m., returned the compliment. The distance approximately was thirty-six miles after being in communication about one hour.

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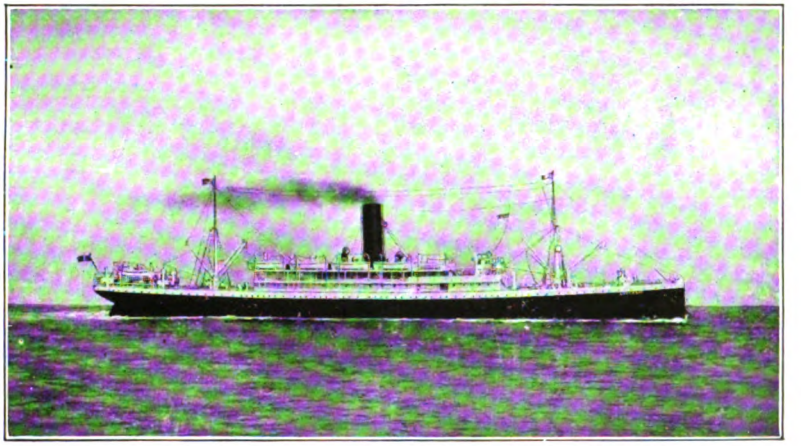
# Maritime Wireless Telegraphy

THE fitting of Messrs. Black & Co.'s s.s. "Kelvinbank," and the Anglo-American Oil Co.'s s.s. "Comanchee" with the ½-kw. cargo sets described in last month's issue is a proof of the growing appreciation by owners of cargo and tramp steamers of the value of wireless communication. It may be that the London Dock strike has shown how extremely useful it would be to have been able to divert cargoes from one port to another by the use of wireless. Further orders have been received for fitting Messrs. Lamport & Holt's s.s. "Veronese," the Union Steamship Company of New Zealand's vessel "Sicamons," Messrs Yeoward Brothers' s.s. "Aguila," Messrs. J. P. Corry & Co.'s s.s. "Star of Ireland," and six Union Castle liners.



*The s.s. "Lanfranc."*

✦

The stream of orders for the fitting of vessels with wireless installations still pours into the Marconi International Marine Communication Co., Ltd. During the last month standard 1½-kw. sets have been fitted to the following vessels: "El Paraguayo" for the Houlder Line, "Waimana" for the Shaw Savill and Albion, "Potaro" for the Royal Mail Steam Packet, "Sutherland Grange" for the Houlder line, "Ben-my-Chree" and "Empress Queen" for the Isle of Man S.P. Co., "Warilda" for the Adelaide S.S. Co., "Dimboola" for the Melbourne S.S. Co., "Arlanza" and "Deseado" for the Royal Mail S.P. Co., "Itatinga" for the Lage's, "Pomeranian" for the Allan Line, "Hydaspes" for the Houston Line, "La Marguerite" for the Liverpool and North Wales Co., "Pardo" for the Royal Mail S.P. Co., and the s.y. "Viking" for the Polytechnic Touring Co.

✦

A correspondent writes to the *Dundee Advertiser* as follows: "I wish to ask two questions in view of the great loss of life during the recent storm on the North Sea. First, should not all our merchant vessels be fitted with the Marconi system, and all our coast-guard stations as well? Disabled vessels could then signal to the shore or to other passing craft for help. Second, should not all our steamers have much more spare sail, which, with an arrangement of telescopic masts and square yards, could be available, in case of need, transforming a steamer into a sailing ship at the will of the master, and thus prevent such disasters as have occurred in the North Sea during the recent gale?"

✦

It is understood that the London Metropolitan Asylums Board have decided to have a wireless installation on a new seagoing tender which is being built to the order of the Board.

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## Reviews of Books

"EXPERIMENTAL RESEARCHES IN ELECTRICITY," by Michael Faraday. (London : J. M. Dent & Sons, Ltd., Everyman Series, 1s.)

In these days, when one is accustomed to live in an atmosphere of change, when the wonders of one day are the commonplaces of the next, the life of any book, even one of the most advanced scientific research, is apt to be brief. It is necessary, above all things, to be up to date—and what are the works of yesteryear? In many cases a mere compilation of hypotheses, since found to be false, and of incomplete and inaccurate deductions. The tendency of literature is to become more and more merged into journalism—the works of to-day to be read, and then replaced by those of to-morrow. It is only occasionally that a work appears which endures, and this is nearly always one which is fundamentally a record of the events of the day. Sometimes a book is produced which is written with the intention of being suited not only to one age, but to all, and that book usually suffers the fate of being read in none.

A case of a work which has lasted, and which is still of value in spite of the advances made, is Faraday's "Experimental Researches in Electricity," which has recently been republished by Messrs. Dent in their "Everyman" series. The work of Faraday provided the basis upon which practically all subsequent developments in electricity have been built. Besides being an experimenter and investigator of almost unequalled ability, he was, by the possession of a highly developed sense of order, able to co-ordinate the work of other men, and by so doing to trace the full significance of discoveries which, individually, seemed of little importance.

A point of particular interest to our readers is that it was from Faraday's researches in electro-magnetic induction that Hertz commenced his investigation which resulted in the discovery of Hertzian waves. Yet this is only a portion of the fruits of his labours—it was from this same research in electro-magnetic induction that the principle of the dynamo was discovered.

We must not think that Faraday knew whither his investigations tended. It was not obvious that these things which have since become so important were of any more value than a hundred other investigations in voltaic and frictional electricity. It is interesting to read now his proof of the identity of frictional, voltaic, magneto, thermal, and animal electricity. It impresses one with the completeness and the method, the sense of order, displayed. Each one of his points *might* lead to important results, and each one had adequate attention. To read it will give the student an insight and a training in scientific research into unknown realms which will be invaluable to those working in such an incompletely explored subject as wireless telegraphy.

Besides instruction, one can gain occasional amusement, for instance, as in paragraph 83, dealing with magnetically induced electricity: "Physiological effects.—A frog was convulsed in the earlier experiments on these currents. The sensation upon the tongue and the flash before the eyes, which I at first obtained only in a feeble degree, have since been exalted by more powerful apparatus, so as to become even disagreeable." One wonders how "disagreeable" Faraday would have found a 110,000 volt shock, and one is inclined to follow the example of the frog in being convulsed.

It must be said in conclusion that Messrs. Dent have done their part very well, and that, although the book contains much interesting matter printed on 336 pages, it is clear, and, like all of the "Everyman" series, of a size convenient to handle, and a price easy to pay (1s.).

"WHO'S WHO IN SCIENCE, 1912," edited by H. H. Stephenson. (London : J. & A. Churchill, 6s. net.)

It is difficult justly to estimate the value of such a work as this upon a cursory examination, and equally so closely to examine and verify every entry. There are some four thousand entries of the names of those distinguished in the various branches of science, and it is evident that some difficulty was found in keeping the work of a reasonable size, while mentioning all who were worthy of inclusion. The result is a certain inequality of treatment, and there would seem to be a distinct bias towards those distinguished in medicine. For instance, we find—

"Marconi, Guglielmo, Elec. Engnr., Watergate House, York Buildings, Adelphi, London, W.C., B. 1874, Bologna. Educ. Leghorn, Bologna Univ. Wireless Teleg."—

while on the same page six times the space is devoted to a gentleman whose claim to distinction rests on investigations of the "Maturation of the Egg of the Mouse." There is a list of abbreviations at the beginning of the book, which, besides giving many abbreviations inaccurately, is not adhered to in the later pages. It is difficult to understand why such an abbreviation as "Mem. Inst.E.E." should be adopted in a book where brevity is of primary importance, when "M.I.E.E." is the usual and accurate form.

The aim of the book is to give a reliable and accurate list of scientific notabilities, with such details as address, date of birth, education, published works, and claims to distinction. Absolute uniformity and perfection of treatment are alike unattainable, and perhaps the volume before us is about as near as it is possible to approach a high degree of perfection within a limited compass.

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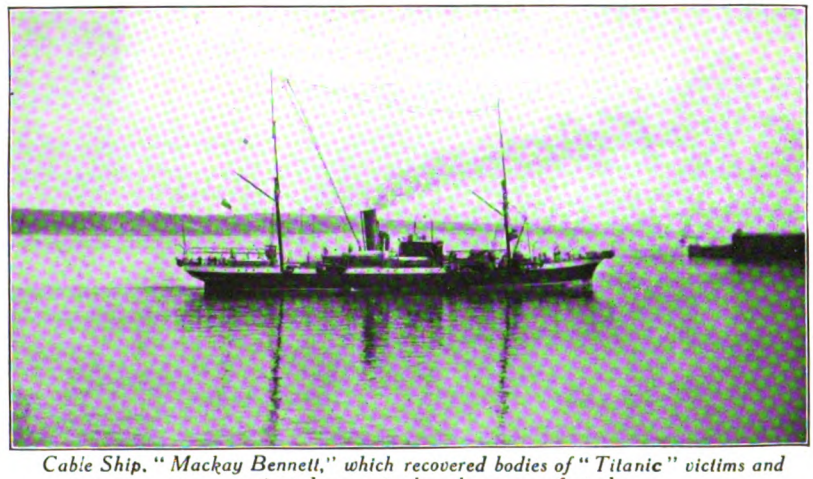
# The "Titanic" Inquiry

INTEREST was lent to the later stages of the "Titanic" enquiry by the appearance on the witness stand of Mr. Marconi, who gave a general description of the working of wireless telegraphy at sea. Mr. Marconi's evidence was take on June 19th. In reply to the Attorney-General, Mr. Marconi stated that the first installation on a large liner of the Marconi system of wireless telegraphy was fitted on the "Kaiser Wilhelm der Grosse" in 1900. In the following year the "Lucania," "Philadelphia," "Campania," "Etruria" and "La Savoie" were fitted with the Marconi system. When the first wireless installation was erected on board a ship the question of its proper administration was the object of much thought. Here was quite a new departure in shipping—a new means of communication requiring careful nursing which must needs be developed consistently with the requirements of navigation and with its own technical and commercial progress. It was recognised that such an undertaking as maritime wireless telegraphy on the stations on the ships of the various nationalities equipped with wireless should be operated not only with uniformity, but also with the proper object of cohesion between ship stations of different nationalities. A form of agreement between the Marconi Company and the shipowners embodying these principles was evolved shortly after the commencement, and remained at the present day in principle practically the same as at first drawn up. Mr. Marconi described some of the signals employed, stating that CQ was a call to all stations. Formerly the call to be given by ships in distress was CQD. Under the regulations the distress signal must not be given except by order of the captain of the ship in distress or by other vessels transmitting it. All stations were required to recognise the urgency of the call, and to make every effort to establish communication with the least possible delay. In 1906 the International Radio-Telegraphic Convention laid down principles and regulations governing wireless telegraphy at sea. These came into force in July, 1908, and they were substantially the regulations now in force. At that time the distress call was altered to SOS, but CQD being so well known was used as well. Mr. Marconi stated that the installation on the "Titanic" was of a very modern type, and was guaranteed for a distance of about 350 miles, but in actual practice it carried a great deal farther. The apparatus was in duplicate, and there was a spare battery by means of which it could be operated in case the current from the dynamos was cut off owing to the engines being flooded. All the largest ships carried two Marconi operators so as to permit of a continuous service being maintained. In such cases one of the operators always had the telephone fixed to his ears, and could hear any call which was made. He could talk or read, however, when not actually receiving or sending a message. Where there was only one operator his duties were specified in a manner calculated to facilitate the establishing of communication with other stations. When not taking rest he must call C.Q. every two hours. Asked to explain the priority of messages, Mr. Marconi said that the message which took priority over everything was the distress signal, then came



*Cable Ship, "Mackay Bennett," which recovered bodies of "Titanic" victims and communicated names to shore by means of wireless.*

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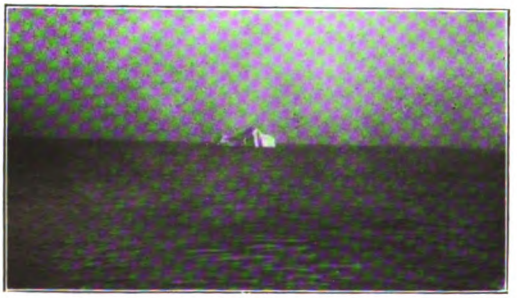
messages of the British Admiralty and other Government departments, and messages of other Governments, messages relating to navigation, messages relating to the conduct of the radio-telegraphic service, and, lastly, ordinary correspondence. Mr. Marconi said, as far as he knew, no vessels were prevented from going to the assistance of the "Titanic" or her boats owing to messages received from the "Titanic," or owing to any erroneous messages being sent or received, nor, as far as he knew, was any vessel prevented by such message from going to the assistance of the "Titanic." The Attorney-General asked Mr. Marconi if he had considered the possibility on a ship with only one operator of a person who was not an expert in wireless telegraphy receiving a simple signal which might be devised so that he could call the operator. Mr. Marconi replied that he had considered that, and thought that if the international regulations allowed it a member of the crew could be instructed to stand by the instrument, to be in



*Iceberg off Cape Race.*

attendance on certain hours when the operator was off duty, and give the alarm and inform the captain in the event of a danger signal being sent. He thought that might be done. At the same time he had a certain feeling that it might not, in many cases, be altogether reliable. Another way that suggested itself to him, and to which he had given a great deal of attention since the "Titanic" disaster, was making the wireless apparatus ring a bell, and thereby give a warning that a ship in danger needed assistance. In order to make the system effective, given that the apparatus was all right, it would be necessary to alter the regulation of the International Convention so as to enable the danger signal to consist of, or be accompanied by, a long dash, as it was called, and an impulse or sequence of waves which would last for a period of fifteen, twenty, or thirty seconds. This would cause a bell to give a prolonged ring, like that which was given on shore by a fire alarm, and that would be a signal to denote that a ship required assistance. Of course, following that signal, particulars might be given of the position of the ship and everything else. Some tests had been made with an apparatus such as he had referred to, and he had considerable confidence that it could be employed, although so far it had not been tested in actual practice. At all events, it was more feasible than the first suggestion. At present the only reliable plan was to have two men on board. Mr. Marconi expressed the opinion that the charts issued to the ships each trip were very important in regard to assisting the operator and letting him know approximately at what time he might expect to be in communication with a certain ship.

## Over Land and Sea.

### Lecture by Mr. Marconi.

When in the United States recently, Mr. Marconi delivered a lecture before the New York Electrical Society on "Recent Developments in Wireless Telegraphy," which has received a good deal of attention in American technical circles.

Mr. Marconi mentioned the fact that the ultra-violet rays in sunlight act on wireless waves just as does fog on light waves, the effect being greater the shorter the wave-length. On this account messages can be sent more easily at night than during the day-time and in cloudy weather than in clear sunlight. It has been noted that the damping effect of sunlight is even greater when either the sending or the receiving station is in darkness than when both are in sunlight, this result being due to the refraction of the waves at the surface separating darkness from sunlight. The fact that messages can be sent more freely over sea than over land is attributable to the greater and more uniform electrical conductivity of the surface of the ocean compared with the land surface.

In closing his lecture, Mr. Marconi stated that Nature has provided in wireless telegraph phenomena both advantages and disadvantages, the advantages always outweighing the disadvantages in connection with the most urgent communications. Under the conditions existing when communications are most desirable and difficult to obtain in any other way—namely, night-time, foggy weather, over troublesome seas, wireless telegraphy is at its very best in every respect.

On Prof. M. I. Pupin's motion, Mr. Marconi was elected an honorary member of the society, and in seconding the motion, Mr. Frank J. Sprague credited Mr. Marconi with saving the lives of those persons rescued from the ill-fated "Titanic" by means of wireless telegraphy.

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# The Imperial Scheme

IN the House of Commons, recently, Mr. Herbert Samuel unfolded his annual Post Office Budget. The normal growth of the primary business of the Post Office—that of carrying letters and printed matter—was to some extent overshadowed by schemes of wider importance. With regard to the idea of a State-owned cable, Mr. Samuel firmly reiterated his conviction that it would be an unwise project for the Government to adopt, or for Parliament to sanction. A feeling reference to the "Titanic" disaster prefaced an announcement that the question of whether wireless installations should be made compulsory on ships, and how far continuous attention to the receivers could be secured was now engaging the closest attention. Mr. Samuel added that the wireless coast service round these islands, which is in the hands of the Post Office, had been greatly improved during the last few months. Its revenue showed a steady expansion; it gave a day and night service round the whole of our coasts, and was in constant touch with the coast communication service, which had been extended by the Post Office at a cost of £75,000, all round the coasts, for the purpose mainly of life saving.

### Linking the Empire

Mr. Samuel next gave the House some further particulars concerning the Imperial Wireless Scheme. He said:

"In March, 1910, the Marconi Company made application for licences for eighteen stations in various parts of the Empire which were to be erected and worked by them, but on full consideration the Government thought it advisable, in view of the great strategic importance especially of those stations, that they should be State owned. The Committee of Imperial Defence was consulted on the matter, and they were of the same view. Last year at the Imperial Conference, a resolution was moved by Sir Joseph Ward on behalf of New Zealand, in favour of the establishment of a State-owned chain of wireless stations in various parts of the Empire, and on behalf of the Home Government I supported that resolution, and it was carried unanimously. Prior to that the matter had already engaged the attention of the Government, but subsequently to the meeting of the Imperial Conference a Committee was formed, over which I had the honour to preside, which included also other representatives of the Post Office, and representatives of the India Office, the Colonial Office, the Treasury, the Admiralty, the War Office, and the High Commissioners of Australia, South Africa and New Zealand. That Committee made exhaustive inquiry into the conditions of the problem with the assistance of experts who were members of the Committee, and gave the closest examination to the proposals of the Marconi Company, and also considered other possible systems of wireless telegraphy. After prolonged negotiations with the Marconi Company, a preliminary agreement was signed some weeks ago accepting their tender for the erection of stations to be purchased and worked by the Government, and subject to the approval of Parliament.

### Details of the Scheme

"It is proposed, in the first instance, six stations shall be erected: the first in England, the second and third on sites which are not yet definitely decided, but which may perhaps be in Egypt or in British East Africa, and at all events in two places on the road to India, the fourth station will be in India, and the fifth in Singapore. The sixth station will be erected within the territories of the South African Union. Other stations are contemplated in the future, but no definite provision is made with regard to them. We think it advisable to proceed cautiously at first to see how far those stations will fulfil our expectations. The Marconi Company give a guarantee that the stations will be able to communicate the distance specified—namely, 2,000 miles and more; in such cases they guarantee also a speed of twenty words a minute, duplex—that is to say, the stations will be able to send messages in one direction, and simultaneously to receive messages from two directions. They also guarantee a speed of fifty words a minute by automatic transmission after allowing for repetitions, and the service is to be continuous day and night. The contract also provides for duplicate engines in case of breakdown. There are many other provisions of the contract with regard to patents and royalties and so forth, but the whole of them will be submitted to the House formally before long, as soon as the details of the contracts and specifications have been completed. The cost in round figures per station, excluding sites and buildings, will be £60,000. There are also provisions with regard to a royalty of 10 per cent. on the gross

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receipts during the period that we may have the use of the present and all future Marconi inventions and apparatus. The Indian Government will pay for the station in India ; the other stations will be paid for direct by the Imperial Government, and the revenue derived from those stations will accrue, of course, to the Government which owns the stations.

### Automatic Working

"Of course, wireless telegraphy, like other telegraphy, is practically instantaneous, and the method and rate of transmission must depend upon the detailed and actual working of the particular station and the way traffic is handled. The contractors will provide the stations, but they will not be really responsible for them. It will be the administration which will be concerned with the working of them. The whole of these matters may perhaps be more usefully discussed, though I do not deprecate discussion to-day, when all the facts are in black and white before the House, as they must be before the approval of the House is obtained for the contract."

As indicated by Mr. Samuel, this great scheme will in due time come before the House of Commons, but even in bare outline it makes a powerful appeal to the imagination.

### Ship Installations

The Assistant Postmaster-General, Captain Norton, who took part in the discussion later, observed that one member who dealt with the question of the cables seemed to ignore altogether the fact that wireless telegraphy was bound to play a very great part in future. In the event of war, as those who had studied military matters knew, cables were likely to be cut or tapped, and it would be impossible to provide a cable which would be absolutely "war proof." The question of wireless telegraphy again cropped up in the House of Commons on a later date, when the Board of Trade estimates were discussed. Mr. Buxton asked what would have happened if the Government had suddenly and prematurely enforced compulsory wireless telegraphy on all ships. "We should have had on our ships, or many of them," he said, "inefficient operators." He found from figures that out of 850 foreign-going vessels no less than 314 of them had carried wireless equipment on board, and there was a large increase in the number of wireless operators. He thought that the feeling was now that the time was ripe for extending the system of wireless telegraphy, and he was considering at the present moment the best method by which that object could be attained.

## Berne Notes

The ratification of the International Convention by the United States Senate was officially communicated to the authorities at Berne by the United States Minister in Switzerland on April 15th. The Telegraph Administration of Bosnia and Herzegovina have also declared their adherence to the Convention and to the Additional Undertaking.

Mr. F. E. Dempster, having retired from the post of Director-General of Telegraphs of British India, the office has now been merged with that of the Director-General of Posts. Sir Charles Stewart-Wilson has been appointed to take charge of the department with the title of Director-General of Posts and Telegraphs.

The following call letters have been applied for by the countries named :—AUSTRIA : OLA, OLB, OLC, OLE, OLG, OLJ, OLK, OLL, OLM, OLN, OLP, OLR, OLS, OLT, OLU, OLV. CANADA : The series from CKA to CKZ. GREAT BRITAIN : QKT, QLH, RBV, RLM, SDK, SNM, VFL, VNQ, VRH. SWEDEN : All calls commencing with the following letters : GB, GD, GF, GI, GK, GL, GQ, GS, GT, GW, GX, except where such letters have already been allotted to other administrations.

Messrs. Crosby Lockwood & Son, the well-known publishers, have transferred their Technical Book Room from 121A Victoria Street, S.W., to more commodious premises at 5 Broadway, Westminster, S.W. (opposite Vickers's House), where a full representative stock of all the latest engineering and technical books may be inspected.

Captain H. Von Simson late of the German Navy, has expressed his opinion (in the course of an interview) that a Parsevel dirigible is better adapted for communicating by wireless than is an aeroplane. The antennæ, he said, had a tendency, when sent swaying by a strong wind, to influence the stability of the vessel, whereas airships were not exposed to the same disadvantage and danger. Thus a dirigible of this kind, starting, say, from Emden, could make its way across the North Sea to within sight of the English coast—its range of diametric vision at a height of 500 metres being an area of forty miles—when it could send its intelligence back by wireless.

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## Official Regulations

### Fiji Islands

WE have been advised that the following interim regulations have been authorised for the Fiji Radio-Telegraphic Service, which was described in THE MARCONIGRAPH last month:

Communication will be carried on where practicable with all vessels trading in these waters, and shore stations fitted with wireless apparatus and conforming to the regulations laid down by the Radio-Telegraphic Convention.

CONDITIONS.—(1) The Department will expedite and facilitate as far as possible the delivery of messages, but is not responsible for their incorrect transmission or non-transmission.

(2) The following classes of special telegrams are not admitted into the radio-telegraphic service in all cases except inter-island traffic:

(A) Reply paid.
(B) Money orders.
(C) Collated.
(D) Acknowledgment of receipt.
(E) "To be forwarded."
(F) Paid services except regarding transmission over land lines.
(G) "Urgents" except on land lines.
(H) Delivered by express or post.

"Reply Paid," "Collect," and "Express" messages are permissible in the inter-island service.

(3) The address of radio-telegrams for ships at sea should be as complete as possible. It must contain the following:

(A) Name of addressee.
(B) Name of ship.
(C) Name of coast station (not charged for).

(4) Senders may expect advice of non-delivery of radio-telegrams. On receipt of such advice senders may intimate by paid service at the rate of 6d. per message to the transmitting station that he desires the message held until the ship is within range, provided that such extension of time does not exceed 30 days.

(5) The charges for radio-telegrams must in every case be prepaid in full by the sender, with the exception of "Collect" messages in inter-island traffic above mentioned.

(6) Reimbursements may be claimed under the following conditions:

(A) When a radio-telegram written in plain language has been rendered useless by inaccurate transmission the whole amount will be refunded. Under no circumstances is the charge for a code of cypher radio-telegram returned on account of an error in transmission, unless such error leads to non-delivery or delay due to negligence on the part of operators.

(B) When a radio-telegram fails to reach its destination through an error on the part of the telegraphic or radio-telegraphic service the whole of the amount will be refunded.

(C) When one or more words have been omitted in transmission, the cost of such word or words will be refunded, provided that it is not less than 10d.

CHARGES.—The total charge for radio-telegrams comprises:

(1) Charge proper for oversea transmission.

(A) "Coast charge," which belongs to the Government.

(B) "Ship Charge," which belongs to the ship station.

(2) Charge for transmission on overland lines. A flat rate of 10d. per word between ship and shore, and 3d. per word for inter-island traffic has been adopted, address and signature included.

Radio-telegrams to be transmitted by cable are charged the cable rates in addition to the above. Radio-telegrams addressed to vessels out of range of the station at which the message originated, but within range of any other island station, will be retransmitted free of charge. Press news of a limited number of words of general interest will be supplied to passing vessels free of charge. Incoming press news to be charged at the rate of 10s. per 100 words or fraction thereof.

DELIVERY FEES AT TAVIUNI ARE AS FOLLOWS:

| | | | | | | |
|---|---|---|---|---|---|---|
| Radius of 1 mile or under | | | | | | free |
| ,, | over | 1 mile | to | 5 | or under | 1s. |
| ,, | ,, | 5 ,, | | 10 | ,, | 2s. |
| ,, | ,, | 10 ,, | | 15 | ,, | 3s. |
| ,, | ,, | 15 ,, | | 20 | ,, | 4s. |
| ,, | ,, | 20 ,, | | 25 | ,, | 5s. |

These charges may be paid by the sender at once, or on receipt of advice as to the actual cost incurred, or they may be guaranteed and collected. Failing this collection from the addressee, the sender will be held responsible.

Certified copies of radio-telegrams may be procured if satisfactory evidence of the identity of the applicant is established, and a payment of 1s. is made. Messages are retained by the department for purposes of reference for a period of 12 months. Such application and

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other correspondence should be directed to the Colonial Postmaster.

All radio-telegrams from Suva should be handed in at the Pacific Cable Board, and receipts demanded for all cash deposited. At Taviuni the messages should be handed to the officer in charge, and stamps to the value of each message affixed by the sender to the same. The Agents of shipping companies whose vessels equipped with wireless apparatus trade in these waters will be held responsible for charges due to the Government by ship stations.

Telegrams should be presented before the vessels are a greater distance than 300 and 200 miles from Suva and Taviuni stations respectively. Until further notice the hours of attendance at the respective offices will be as follows :

| | |
|---|---|
| SUVA. | 10 A.M. to 4 P.M.<br>8 P.M. to 2 A.M. |
| TAVIUNI. | 10 A.M to 4 P.M.<br>8 P.M. to Clear. |

*Sundays.*

| | |
|---|---|
| SUVA. | 10 A.M. to 10.30 A.M.<br>8 P.M. to 2 A.M. |
| TAVIUNI. | 10 A.M. to 10.30 A.M.<br>8 P.M. to 8.30 P.M. |

CHARGES.—(1) Ordinary :

(A) Ship to Suva wireless station—10d. per word flat rate, address and signature included. Cr. 6d. to Fiji and 4d. to ship.

(B) Ship to Taviuni or Labasa wireless station—10d. per word plus delivery charges at rate of first mile free, over 1 to 5 miles, 1s. ; 5 to 10, 2s. ; 10 to 15, 3s., etc.

(C) Ship to land stations (only Levuka at present)—10d. per word plus land rate of 1s. per 10 words, and 1½d. every additional word.

(D) Ship to cable—10d. per word plus cable charges. Cr. 6d. plus cable charges to Fiji and 4d. to ship.

(2) Press news of general character—10s. per 100 words or fraction thereof.

Limited number of words of extraordinary news supplied free of charge.

| | | |
|---|---|---|
| CALLS.—Suva | ... | SVA. |
| Taviuni | ... | TAV. |
| Labasa | ... | LAB. |
| POSITIONS.—SVA. | Long. 178.27E. | Lat. 18.8S. |
| TAV. | Long. 179.59W. | Lat. 16.26S. |
| LAB. | Long. 179.22E. | Lat. 16.26S. |
| RANGE.—SVA. | 300 miles daylight. | |
| TAV. | 200 ,, ,, | |
| LAB. | 300 ,, ,, | |
| WAVE LENGTH.—SVA. | 300 to 1200 metres normal 600 metres. | |
| TAV. | 300 to 600 metres normal 600 metres. | |
| LAB. | 300 to 600 metres normal 600 metres. | |

## Falkland Islands.

An Ordinance (No. 3 of 1912), dated March 15th, 1912, has been published, which provides for the regulation of wireless telegraphy in the Falkland Islands. It is provided that no person shall establish any wireless telegraph station or instal any apparatus for wireless telegraphy in any place or on board any British ship registered in the Colony, except under and in accordance with a license granted in that behalf by the Governor in Council. No person shall work any apparatus for wireless telegraphy installed on any merchant ship (whether British or foreign) whilst that ship is in the territorial waters of the Colony, otherwise than in accordance with prescribed regulations. *The* Wireless Telegraphy Ordinance of 1903 *is* repealed.

## Australian Notes.

The wireless operator of an Australian Inter-Colonial steamer reports having received signals from the s.s. "Turakina" for ten consecutive days. Communication was maintained for nine days, but on the tenth night the Inter-Colonial steamer's apparatus was not sufficiently powerful to be heard by the "Turakina," the intervening distance being over 3,000 miles. The "Turakina" is fitted with standard Marconi 1½-kw. ship installation.

* * *

The Technical College at Ultimo has opened a course in wireless telegraphy, under the charge of Mr. R. C. Simpson, A.K.C., A.M.Inst.C.E. The students include 90 men and one girl.

* * *

Messrs. Burns, Philp & Co.'s passenger steamer "Mataram" has been fitted with wireless, the range being 1,500 miles. The same company's s.s. "Montoro" is already fitted ; and the installation of wireless on these liners directs attention to the urgent need for more land stations on the North Queensland coast. The Dutch Government has commenced to link up the islands of the Dutch Archipelago.

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## Old Martello Towers.

Dotted round the English coast are relics of a bygone civilisation which have been pressed into modern service. An example of this is the conversion of the Martello tower on the beach at Felixstowe into a wireless telegraph and coastguard station. This juxtaposition of ancient and modern means of coast defence is a striking reminder to visitors to this well-known Suffolk seaside resort that wireless telegraphy has developed into an implement of immense importance in naval affairs.

*Old Martello Tower at Felixstowe fitted with Wireless.*

The Martello tower was introduced into England in consequence of an incident in the French revolutionary wars in the year 1793, and the strong resistance offered by these towers led to the conclusion that they were specially formidable. Martello towers were built in large numbers, and at heavy expense, along the shores of England, especially on the Southern and Eastern coasts, which in certain places were lined with these towers at short intervals. They are structures of solid masonry, containing vaulted rooms for the garrison, and providing a platform at the top for two or three guns.

The "P" Martello tower on the beach at Felixstowe has been used as a coastguard station for some years, but was later fitted up with Marconi telegraph apparatus for the use of the Eastern District sub-station. The main and top masts are of Oregon pine, and the former is believed to be the largest ever cut from one tree, being about 90 feet long and 2 feet in diameter, the masts themselves being kept in position by wires fixed to four massive iron chain plates fixed into the ground with solid concrete blocks.

There were originally several of these old towers hereabout, but two or three of them have now been demolished, the old "Q" tower on the cliff being the last to share this fate early last year.

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In the course of a lecture on the "Emission of Waves," delivered at the Birmingham University, Sir Oliver Lodge said the whole world had recently had its attention called to the subject of wireless telegraphy by one of those catastrophes which occurred from time to time—in this case eclipsing all the others. Without wireless telegraphy we should have known very little, perhaps nothing, about the loss of the "Titanic." It would have been one of those cases where a ship disappeared on the high seas, was heard of no more, and concerning the manner of whose loss there would be merely speculation. That was what happened in the southern seas in the case of the "Waratah," about which uncertainty prevailed for months. The certainty we had about the "Titanic" was painful enough, but it seemed preferable to a mere condition of uncertainty. The persons rescued, though few, owed their safety, so to speak, to the achievement of wireless telegraphy.

The Rev. H. V. Gill delivered a lecture on "Wireless Telegraphy" at the Belvedere College, Dublin, on May 6th. The lecturer stated that it was fitting that they who had charge of the education of boys should demonstrate to them the progress of science, and show what it had accomplished. There was no doubt that the recent disaster was one of the most momentous in the history of the world, and but for the use of wireless telegraphy it would ever have remained a mystery. The occurrence showed that as science progressed and as dangers increased, so also the means of obviating them increased. The lecturer explained how electric sparks were generated and how ether waves were produced. He dealt exhaustively with the mechanism of a wireless installation, and showed by actual demonstration how wireless messages were transmitted and received. He expressed the belief that the Marconi system would soon reach even a more perfect stage than it had now attained. In conclusion, the lecturer showed a number of slides illustrating some of the instruments used in connection with the Marconi system.

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## Personal

The honours list on the occasion of the King's birthday, issued on June 14th, contained but few names connected with physical science or engineering. The honour of knighthood was conferred upon Mr. C. A. King, C.B., who has long been connected with the Post Office service in various capacities, and is now comptroller and accountant-general. Mr. S. K. L. Yeats, the accountant-general of posts and telegraphs in India, had conferred upon him the honour of C.I.E., while the C.M.G. was conferred upon Mr. D. Robertson, the secretary of the Post Office and Telegraph Department of New Zealand.

Dr. W. H. Eccles, head of the Department of Mathematics at the South-Western Polytechnic Institute, has been appointed to the new University readership in graphics tenable at University College. This post carries with it the status of a teacher appointed by the Senate of the university, and is the result of a division of the work of the department of applied mathematics and mechanism, the chair of which was recently resigned by Professor Karl Pearson. That part of the mathematical work which deals especially with the requirements of the engineering student will now devolve upon the Reader in Graphics.

## Athletics

Twice in the course of the season the Marconi Cricket Clubs representing the head office in London and the works at Chelmsford engage each other in battle royal. The first of these matches was played on the ground of the London club at Acton Town on Saturday, June 15th. From the beginning of the game it was evident that the teams were very evenly matched, and a keen fight terminated in a victory for the home team by the narrow margin of six runs. After the match tea was served in a marquee erected on the ground, followed by a Bohemian concert, a very good programme being provided by members of the staff of the London office. On Saturday, June 22nd, the club met and were defeated by Fulham Palace by 31 runs, the Palace, batting first, making a total of 107, leaving the Athletic Club to get 108 to win. This they proceeded to do, and the score read 64 for 4 wickets, when a rot set in, and the rest of the side were out for an additional 12 runs, the final score being 76 (Bates, 32; Smith, 11; Burden, 10). The fielding of the Marconi Club left a lot to be desired, no less than fourteen catches being missed.

## Movements of Operators

A. Johnson, from the School to the "Ben-my-Chree."
G. R. Tyler, from the "Empress of Ireland" to the "Corsican."
A. Gibson, from the "Oceanic" to the "Cretic."
K. S. Cawhey, from the "Hilary" to the "Elmina."
A. E. Baker, from the "Francis" to the "Buccaneer."
C. C. Goulding, from the "Celtic" to the "Lake Manitoba."
A. C. Arnold, from the "Winifredian" to the "Hilary."
J. R. Kingsford, from the "Mauretania" to the "Laurentic."
T. J. Chapman, from the "Gloucestershire" to the "Leicestershire."
W. Davies, from the "Carmania" to the "Mauretania."
R. H. Mountain, from the "Merion" to the "Mauretania."
H. K. Gibsone, from the "Anselm" to the "Merion."
F. N. Calver, from the "Cedric" to the "Oropesa."
W. J. Wing, from the "Corsican" to the "Runic."
J. E. Davies, from the "Carmania" to the "Stephen."
J. Biggins, from the "Laurentic" to the "Vandyck."
P. Greaves, from the "Victorian" to the "Winifredian."
H. Sequeira, from the School to the "Adriatic."
J. Boadella, from the "Canadian" to the "Anselm."
C. W. Pain, from the School to the "Celtic."
L. Smith, from the "Lusitania" to the "Christopher."
C. J. Lawrence, from the School to the "Dominion."
H. Matthews, from the School to the "Empress of Britain."
R. Chitham, from the School to the "Laurentic."
G. McCormack, from the "Connaught" to the "Leinster."
J. D. Lavelock, from the School to the "Lusitania."
L. Taylor, from the School to the "Laconia."
C. J. Alford, from the "Hildebrand" to the "Devonian."
H. E. Wright, from the School to the "Victorian."
H. R. Beynon, from the School to the "Viking."
V. F. Evans, from the "Corinthian" to the "Arabic."
F. J. Lovett, from the School to the "Arabic."
P. L. Brownfield, from the "Navahoe" to the "Æneas."
F. E. Garlick, from the School to the "Campania."
B. F. Emery, from the School to the "Canada."
A. Birch, from the School to the "Canadian."
A. G. Dicks, from the School to the "Caronia."
S. W. Brown, from the "Tunisian" to the "Gloucestershire."
J. R. Thomson, from the "Oravia" to the "Hildebrand."
J. A. Craigie, from the "Canada" to the "Orita."
W. Condon, from the "Armenian" to the "Tunisian."
R. A. Bernard, from the School to the "Tunisian."
H. D. Humphries, from the "Tritonia" to the "Cassandra."
J. T. Williams, from the "Sardinian" to the "Tritonia."
C. E. Rookes, from the "Viking" to the "Pomeranian."
T. Horne, from the "Dunluce Castle" to the "Mantua."
C. A. Hill, from the "Orama" to the "Demosthenes."
R. Harding, from the "Galway Castle" to the "Intaba."

## Movements of Engineers

H. Dobell, transferred from Imperial Stations work to Broomfield, in charge of Instructional Department, to relieve.
R. G. Kindersley on leave.
Lt. A. Loveband, transferred from Chelmsford Test Room to the Field Station Department.
G. H. Major, Poldhu, from Clifden, assisting.
B. S. Benning, Poldhu, from London Drawing Office, assisting.
S. F. Kos and D. H. Jones on passage to England from Borneo, the stations at Balikpapan and Tarakan having been taken over.
H. M. McCullough, S. R. Groser, S. L. Dashwood, R. R. Cooke, and J. D. White on leave, after completion of India Government stations.
C. James on leave, after completion of Constantinople station.
E. Ichino, returned from Coltano, Italy, now attached to the London office assisting on the work of the Imperial scheme.
A. G. Savill, returned from Clifden, now attached to London office on ship work.
C. J. Robb, special experimental work at Chelmsford.

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THE
# MARCONIGRAPH

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## The Imperial Wireless Scheme

ON July 23rd the Treasury issued, as a White Paper, the text of the agreement between Marconi's Wireless Telegraph Co., Ltd., and the Postmaster-General with regard to the establishment of a chain of Imperial wireless stations, together with a Treasury minute explanatory of the reasons which have actuated the Government, and of the negotiations which led up to the adoption of the scheme.

After a series of prolonged conferences, in which the representatives of the Dominions, of the Government of India, and of the various departments concerned took part, the scheme embodied in the agreement was finally settled. While the accepted principle was that the Governments concerned must own and work the stations on their territories, it was recognised as essential to secure the co-operation and assistance of one of the existing wireless telegraphy companies, both on account of their possession of patents and in order to have the benefit of actual experience in transmitting long-distance wireless messages; and in experience of such long-distance working as was required by this scheme the Marconi Company far surpassed any other.

It was not considered necessary to adopt at the outset such a wide scheme as that proposed in 1910 by the Marconi Company, and it was eventually decided that a chain of stations connecting the United Kingdom with Australia (*viâ* India) and with South Africa should be established in the first instance—the installations to be erected in England, Egypt, the East African Protectorate, South Africa, India, and Singapore. The Australian Government finally decided not to take part in the agreement, but to proceed independently with the erection of a station in connection with the Imperial wireless chain. It is intended that this station shall be constructed without delay, and that it shall communicate direct with the Imperial station at Singapore.

Under the agreement the sites are to be provided by the Postmaster-General, while the company will provide the installations (including apparatus, power plant, and machinery), in accordance with specifications to be approved by the Postmaster-General—who is to act in this matter, as in others, on behalf of the Governments concerned. Should other commercial stations capable of continuous communication over a range of not less than 2,000 miles be required to be erected during a period of five years by any Government which is a party to the agreement, the company will have the exclusive right of providing them. After the expiration of that period they may further be required by the Postmaster General to provide such installations at any stations in the British Empire which he may specify. The price of each installation will be £60,000.

The Postmaster-General will have the right to use in the stations during the "royalty" period any future patents of which the Marconi Company has the use, and both the company and Mr. Marconi, and also any person whose patents, etc., they acquire, are bound to give the Government information and advice.

If the Government adopts a system which makes no use of valid and still unexpired patents owned exclusively by the company, and ceases to use the Marconi patents, it may terminate the "royalty period" at any time. Subject to this exception, the agreement and royalty period are only terminable at the expiration of eighteen years, subject to six months' notice. If not terminated in either of these two ways the royalty period runs for twenty-eight years.

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CAPT. CECIL NORTON, M.P.

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# Capt. Cecil Norton, M.P.,

## Assistant Postmaster-General

WITH the termination of the International Radiotelegraphic Conference it is fitting to reflect upon some of the features which have distinguished one of the most notable gatherings ever held in this country. Of the results achieved we need say nothing here, for they are dealt with in another part of this issue. One feature which stands out prominently is the warmth of the hospitality which has been extended towards the representatives of foreign nations who visited this country in connection with the conference. The success of the social side of the gathering is due in the main to the well-planned and representative list of entertainments provided for the visitors, and a meed of praise is due to the Reception Committee of the Post Office for the admirable manner in which the arrangements were carried out. Courteous and tactful to a degree, every member of the committee was unsparing in his efforts to ensure the success of the gathering, and the appreciation of the distinguished visitors was expressed in no unmeasured terms in the course of private conversation. His work on the Reception Committee is a striking testimony to the ability of Capt. Cecil Norton. But it required no such occasion to demonstrate the indomitable energy and organising skill of the subject of our present sketch, who, as second in command of that vast organisation—the Post Office—has already made his mark in the administrative affairs of this country.

Capt. Norton is possessed of wide knowledge of men and affairs, as a brief survey of his career will show. He was born in Ireland, being the eldest son of the late Rev. William Norton, rector of Baltinglass, co. Wicklow. His earlier education was obtained abroad, but he returned to his native country, and obtained the distinction of being double prizeman in modern languages at Trinity College, Dublin. He similarly distinguished himself on leaving Dublin at the Royal Military College, Sandhurst, and after this successful scholastic career he entered the Fifth Royal Irish Lancers. With this regiment he spent some years in India, and during this time he obtained considerable knowledge of Hindustani, and when he later passed through the Staff College at Sandhurst he distinguished himself once more by his linguistic ability in that language as well as in German, French and Italian.

He was next selected by the government of that day to report upon the Italian cavalry, and on his return he became Brigade-Major of Cavalry at Aldershot. This concluded his military career. It is worthy of note that throughout his career in the Army he passed the whole of his leave in travelling, studying the languages, the customs, and the administrations of other nations.

Capt. Norton next turned his attention and devoted his time to politics—his earliest entry into the political arena being two unsuccessful attempts to capture Great Yarmouth in the Liberal interest in 1885 and 1886. In the following year, in response to the invitation of the Liberals of West Newington, London, he became candidate for that constituency, which, at the election in 1892, he won by a large majority, and which he still represents. Since that time his energies have been usefully employed in many directions, but he has always shown his greatest interest in the improvement of the conditions of the lower-paid workers of the State. It seemed obvious to him that any general improvement in the conditions of labour in this country must of necessity be preluded by the conversion of the Government into a model employer. With this end in view he has on three separate occasions been instrumental in improving the conditions of the Police force, while he has always given his best endeavours in the service, and has earned the sincere gratitude, of the postal employees of the nation. It would be quite impossible to mention all the classes which have benefited by his labours, or to estimate the debt which they owe him.

In Mr. Asquith's first ministry he was a Junior Lord of the Treasury, and he afterwards succeeded Sir Henry Norman as Assistant Postmaster-General. In that position his knowledge of the customs and administrations of other countries has been conducive to the smooth running of the international postal and telegraphic services, and it is in this position that he was brought in contact with the International Radiotelegraphic Conference, for the successful organisation of which he is so largely responsible.

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# The International Radiotelegraphic Conference

## Summary of the Decisions

THOSE who followed the proceedings of the International Radiotelegraphic Conference, held in London from June 4th to July 2nd, could not fail to be impressed by the important position which wireless telegraphy has taken in the short period of less than two decades as a means of communicating intelligence from place to place over the face of the globe. The youngest yet most vigorous "child of telegraphy" has touched all nations, and of this we had ample evidence in the representative gathering held in London.

At the previous Conference in Berlin the general plans for the regulation of wireless communications were fairly well formulated, but since that time there have been improvements in the art, and a vast amount of valuable experience has been gathered to serve as a guide for future action. The most important regulations established at the Berlin Conference in 1906 were those governing the sending of wave-lengths over different classes of service and interchange of maritime messages. Thus the main object of securing easy communication between ships and the shore with a minimum of interference and difficulty was in a measure attained, but experience has shown that much still remains to be done before the difficulties of the situation can be cleared away.

### Compulsory Wireless

Until the report of the Conference recently closed is available, we shall not be in a position to learn how far the revised Convention will meet the existing situation. Judging from a brief report published, it appears that the Conference has taken the opportunity to revise and amend the regulations for the exchange of messages between ships and the shore by means of wireless telegraphy, and it has passed a resolution to the effect that upon certain classes of ships there should be imposed a regulation to carry radiotelegraphic equipments. In addition it recommended that every maritime country should establish a number of coast stations with a permanent wireless telegraph service. These resolutions were carried unanimously, and now await ratification by the governments whose representatives have agreed to them. An increased demand for instruments, plants, and operators is likely to follow as the result of the ratification of these resolutions.

It was at the request of the British Government that the Conference gave special consideration to the question of the use of wireless telegraphy for the prevention of disasters at sea. The text of the resolution was as follows:

> "The International Radiotelegraphic Conference having examined the measures taken with a view of preventing disasters at sea and of rendering assistance in such cases, expresses the opinion that in the general interests of navigation there should be imposed on certain classes of ships the obligation to carry a radiotelegraphic installation. As the Conference has no power to impose this obligation, it expresses the wish that the measures necessary to this end should be instituted by the governments. The Conference finds it important, moreover, to ensure as far as possible uniformity in the arrangements to be adopted in the various countries to impose this obligation, and suggests to the Governments the desirability of an agreement between themselves with a view to the adoption of a uniform basis for legislation. Lastly, the Conference recommends to the Governments the desirability of establishing in each maritime country a number of coast stations with a permanent service adequate for the needs of navigation."

### Ensuring Public Safety at Sea

The new regulations contain several proposals intended to render more effective the service of wireless telegraphy in the case of distress at sea. Ships will in future be required to provide an auxiliary source of power able to work the wireless apparatus for at least six hours. This emergency installation must be placed in as secure a position as possible, and must be entirely self-contained, so that an accident to the ship which stops the working of the ship's engines need not affect the wireless apparatus.

Other resolutions which have been passed show that the Conference was influenced by the circumstances attending the recent shipping disaster, and evidences a desire of the delegates to take prompt action upon a matter at issue concerning public safety. Thus steps have been taken to lessen the danger of distress signals going unheard by laying down rules as to attendance of the wireless operators on

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various classes of ships. On ships of the first class a permanent watch will be required, and in this case two fully qualified operators at least must be carried. On ships of the second class, where a permanent watch is not considered practicable, the operator must listen during the first ten minutes of every hour. This does not require the regular operator to attend to the instrument during the periods stated; the effect of the resolution is that a junior officer or some member of the crew will be trained to listen to the distress call, and that he will stand by the apparatus during the first ten minutes of every hour, thus ensuring that no distress call goes unheard during the time that the regular operator is off duty. There should be no difficulty in training the junior officers or members of the crew for this duty, especially when it is borne in mind that instruction in wireless telegraphy is given on board training ships. In the smallest ships, such as fishing boats, etc., no regular periods of watch is prescribed. Each Government in giving a licence to a ship to carry wireless telegraph apparatus is to determine in which of these classes the vessel is to be placed.

Rules have also been made for both ship and shore stations to suspend work, and to listen at the end of each quarter of an hour in cases where it is likely that distress calls may otherwise not be heard. To prevent confusion, the ship in distress will in future have control over the wireless working of all stations in its vicinity, while the operators on every ship are now specifically placed under the authority of the captain.

### Prevention of Confusion

Provision has also been made for giving priority of transmission of weather reports from ships and for keeping coast stations supplied with weather forecasts for communication to ships on demand.

In order to prevent confusion in working, the regulations adopted at the Berlin Conference required ships to communicate with the nearest shore station, various proposals being made so as to allow communication between a ship and a station which is not the nearest. These proposals gave rise to considerable discussion, and a regulation was finally adopted which permits such communications provided that a special specified wave-length is used for the apparatus, but which at the same time limits this exceptional arrangement to the case of communications exchanged between a ship and a shore station in the country to which the ship belongs.

The transmission of radiotelegrams from a ship to the shore, and *vice versa* by means of one or more intermediate ships, is becoming frequent. Regulations were adopted as regards charges, accounting, etc., which it is expected will facilitate this service.

Numerous other changes, mainly of a technical character, were made in the regulations with the object of promoting the smooth and expeditious working of the service. In this connection it may be mentioned that, as already published in the July issue of THE MARCONIGRAPH, all the countries concerned have now agreed that all ships should be under the obligation of inter-communication with one another, irrespective of the system of raido-telegraphy employed.

It was decided that it would be premature to attempt to lay down regulations for the long-distance service between land stations, and it was expressly laid down that each country remains free to organise a service of its own as it thinks best, the only principle laid down being that interference between different stations must be avoided as far as possible, and that differences on the system of wireless telegraphy employed must not be a basis for refusing any communication.

*Dr. Frederic Chevalier Wagner de Jauregg, Chief of the Austrian Delegation.*

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# The Cradle of Transatlantic Wireless

## Po'dhu Re-Visited. An Historic Station. Important New Developments.

A MORE fitting termination to the round of visits paid by the delegates to the International Radiotelegraphic Conference than a week-end trip to Cornwall, it would be most difficult to imagine. Nowhere around Great Britain is there such sailing among fairy lands of romance, for the lofty poles at Poldhu—which proclaim to the world the fact that Cornwall is still playing an important part in the developments of science, as it did in the far-off days of Richard Trevithick and Humphry Davy—are as stimulating to the imagination as was the weird Arthurian legend. Everything combined to make the visit a memorable one. Fickle June conceded breezy, sunny days, and the visitors were able to enjoy "the softest, sweetest air in the world, air which takes from the Atlantic gales all their refinement and none of their blustering roughness." Two hundred guests made the journey of 292 miles from Paddington to Falmouth in record time in a special train provided by the Great Western Railway Company. The British Post Office, who were the hosts on this occasion, displayed a warmth of hospitality which is only to be compared with the unremitting labours of the Members of the Reception Committee, whose arrangements were carried out to perfection. The party arrived at Falmouth at 4 p.m. on Friday, June 29th. On the following morning they visited the Marconi station at Poldhu at the invitation of Marconi's Wireless Telegraph Company, returning to Falmouth in the evening. On Sunday afternoon the guests were taken for a trip up the charming River Fal as far as Truro, where they boarded the special train which was to convey them to London.

*The Station Buildings and one of the New Masts.*

The *raison d'être* for the excursion was the visit to Poldhu, which was made in ideal weather. On arrival the guests were entertained to luncheon by the directors of Marconi's Wireless Telegraph Company—a happy luncheon at which there were next to no speeches. Mr.

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Marconi in the single sentence which he uttered in response to the plaudits of the guests said he would say, "*Una cosa sola: Grazie*"—a word which was echoed to all who had conspired to make the visit memorable. After luncheon came the inspection of the station itself. Here we may make a slight digression to recall some incidents in the history of that famous station.

In January, 1901, Mr. Marconi established wireless communication between St. Catherine's in the Isle of Wight and the Lizard in Cornwall, a distance of 200 miles. Previously to this, however, in June, 1900, when Mr. Marconi returned from the United States after having

*The Marconi Station and Poldhu Hotel. The tent in the foreground is where the Delegates were entertained to Luncheon.*

achieved the feat of sending wireless messages over 100 miles, he had arrived at the decision to make a serious attempt to send an electric wave across the Atlantic and detect it on the other side. He had long held in view the application of his system of wireless telegraphy to Transatlantic working, not merely as an experimental feat, but with the object of making it a means for commercial communication. It was obvious, however, that if such a purpose was to be brought to fruition it would necessitate the employment of more powerful electro-magnetic waves than those previously used, and it was above all things necessary to be perfectly certain that the production of these waves would not prevent or cripple the already established wireless communication between ships and the shore. Moreover, the nature of the plant to be employed required careful consideration. After many experiments the construction of plant was commenced. A convenient site at Poldhu, near Mullion, on the coast of Cornwall, was leased in August, 1900, for the erection of the first electric wave power station, and the construction of appropriate buildings was commenced in October, 1900, by Marconi's Wireless Telegraph Company. In the interests of scientific history it may be well just to mention briefly the facts and dates connected with the first serious attempt at Transatlantic wireless telegraphy.

The machinery began to be erected at Poldhu in November, 1900, and at the same time the nature of the aerial that it was proposed to employ was decided. The aerial was to consist of a ring of twenty masts, each 200 feet high, arranged in a circle 200 feet in diameter, the group of masts supporting a conical arrangement of wires insulated at the top and gathered together at the lower point in the shape of a funnel. In December, 1900, the building work was so far advanced that drawings were prepared showing the arrangement proposed for the electric plant in the station; this being delivered, experiments were carried out at

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Poldhu in January, 1901, for the purpose of ascertaining how far it would be efficient for the purpose in view. At Easter, 1901, by means of a short temporary aerial, experiments

*Mr. Marconi (in the centre) with Commandeur Pullino (on the extreme left) and Capt. Bardelloni (with Camera).*

were conducted between Poldhu and the Lizard, a distance of six miles, which were sufficient to show that the work was being conducted on the right lines. During the next four months much work was done in modifying and perfecting the wave generating arrangements, and numerous telegraphic tests were conducted during the period by Mr. Marconi between Poldhu in Cornwall, Crookhaven in the South of Ireland, and Niton in the Isle of Wight. A delay occurred owing to a storm on September 18th, 1901, wrecking a number of the masts, but sufficient restoration of the aerial was made by the end of November, 1901, to enable Mr. Marconi to contemplate making an experiment across the Atlantic. He left England on November 27th, 1901, in the s.s. "Sardinian" for Newfoundland, having with him two assistants, Messrs. Kemp and Paget, and also a number of balloons and kites. He arrived at St. John's, in Newfoundland, about December 5th, and made arrangements for sending up a balloon and an attached aerial wire, having previously instructed his assistants in Poldhu to send from 3 p.m. to 6 p.m. each day a programme consisting of the letter "S" (which in the Morse code consists of three successive dots) at short intervals. Signals began to be sent out in this way from Poldhu on Wednesday, December 11th, and after some difficulty in elevating the aerial wire in Newfoundland by means of a kite, Mr. Marconi received the "S" signals at Newfoundland on Thursday, December 12th, 1901. On Friday, December 13th, he confirmed this result, and on Saturday, December 14th, 1901, he was able to send a message to Major Flood-Page, one of the directors of Marconi's Wireless Telegraph Company in London, to this effect:

> "St. John's, Newfoundland, December 14th, 1901. Signals are being received, weather makes continuous tests very difficult, one balloon carried away yesterday."

In these experiments the actual power employed in Cornwall for the production of the waves was not more than 10 or 12 kw. The sending aerial consisted of fifty bare stranded copper wires 7/20 in size, suspended from a triadic stay strained between two masts 160 feet in height, and 200 feet apart. The wires were arranged in a fan shape, and connected together at the bottom. With this arrangement, however, electromagnetic waves were produced which crossed the Atlantic and retained sufficient energy at a distance of 2,200 miles to influence the receivers employed by Mr. Marconi. In February, 1902, Mr. Marconi made arrangements for the erection at Poldhu of a permanent structure for carrying a large aerial. This consisted of four wooden lattice towers, each 210 feet high, placed at the corners of a square 200 feet in size. The towers carried insulated rope triadic stays, from which was suspended a conical arrangement of 400 copper wires forming the aerial, put up in sections so that more or less could be

*A group of Delegates and their friends outside Poldhu Station.*

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employed. The buildings for the generating plant were placed in the middle of the area, additional machinery was obtained, and improvements carried out which were indicated by experience. At the same time similar towers were erected in Cape Cod in Massachusetts, U.S.A., and Cape Breton in Nova Scotia.

We have only to glance backwards at the early history of any great electrical work to see that when there is substantial scientific achievement on which to work, technical skill and commercial enterprise have a foundation on which a superstructure of commercial

*Delegates leaving Poldhu for Falmouth after the visit to the Station.*

success may be subsequently erected, even though great initial difficulties have to be faced. The facts that were established beyond question by the end of 1902 were that telegraphic messages could be sent 3,000 miles across the Atlantic by electro-magnetic waves with great speed and certainty. It is unnecessary to recall the recent achievements in long-distance wireless telegraphy, for these are sufficiently familiar to everybody. One important matter, however, was completely settled as far back as 1903—namely, that the power station working could be conducted without any interference with the ship to shore or ship to ship wireless telegraphy. Statements having been made at that time to the effect that the establishment of power stations for the production of electro-magnetic radiation suitable for long-distance telegraphy would render it impossible to conduct the highly necessary ship to shore communication, arrangements were immediately made for putting this contention to the crucial test. There was at Poldhu in those days a mast and aerial 100 yards or so away from the aerial of the power station. Six miles away, at the Lizard, there was a Marconi station for communication with vessels proceeding up and down the Channel. It was arranged that at a certain time wireless messages should be sent off simultaneously from the power station and from an ordinary ship equipment in connection with the isolated mast at Poldhu, and received on two Marconi receivers connected to the aerial at the Lizard. These experiments took place in March, 1903, and different messages were handed in to the sending operators at the power station and neighbouring small or ship station, the operators not knowing a moment before the message which would be given to them. Some of these messages were in cipher, and some of a commercial character. For example, the following

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*Delegates leaving the Steamer at Truro on the return journey.*

cipher message was dispatched in Morse code from the power station :

> " Bulfish, London Streamlet Solstice Turtle Worthily, John Brown, Captain."

Simultaneously, the following was dispatched from the small station 100 yards away—namely :

> " A thick fog prevails here. S.S. ' Mignonette ' has been run down by a foreign ship, send tugs immediately."

At the Lizard station all these messages were received by Mr. Marconi and printed on Morse slips, pair and pair simultaneously, on two independent Marconi receivers attached to the same aerial. In no case was any mistake made. To be sure that the power station was sending out waves much more powerful than the small station, other receivers were placed at Poole, 200 miles away, and the messages from the power station alone were recorded there. These were telegraphed back for verification by postal telegraph immediately on arrival.

During the intervening years the Poldhu station has been in active operation, and press messages intended for newspapers and bulletins published on Atlantic liners have been sent through this station. The old plant consists of a tandem compound horizontal steam engine and a 75-kw. belt-driven alternator, which supplies single-phase current, 25 periods, to a bank of 400 Poldhu condensers through static transformers. This has been supplemented by a turbine of 110 horse-power, and direct-coupled to a 200-cycle alternator of 75 kw. The turbine makes 20,000 revolutions per minute, but the speed of the alternator shaft is only 2,000 revolutions, the reduction being effected by helical gearing with forced lubrication. Another new turbine of 15 horse-power drives a 10-kw. dynamo for lighting and charging the battery. The speed of this turbine is 24,000 revolutions, reduced by gearing to 2,400, while a third turbine of 5 horse-power has been installed for pumping the condenser water. Formerly, water for condensing purposes was pumped from the foot of the hill, but in order to overcome the possibility of a breakdown through the failure of the pumps, a reservoir has been erected for the supply of condensing water.

The new alternator charges a bank of 144 condensers, constructed of zinc plates suspended in oil ; a smaller number is required than with the old alternator, because of the higher frequency of the current with which they are supplied. The result is a considerable economy

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of space. The discharger in the old plant is of the Marconi disc type, and is driven by a separate motor, whereas in the new plant it is carried on the same shaft as the new alternator, and is thus driven direct by the large turbine. In the latter case the apparatus takes the form of a rimless wheel with a number of copper spokes which rotate in close proximity to a pair of electrodes. Each of the latter consists of a brass disc which is slowly rotated by worm gearing so as continuously to present a fresh surface for the passage of the spark, and the whole apparatus is enclosed in a brick chamber through which a current of air is passed. In this way trains of oscillations are produced at the rate of 400 a second, which are heard in a telephone at the receiving station as a musical note of definite pitch.

The four wooden lattice columns have been demolished, and six masts, two of steel and four of wood, now support the aerial, which is of the L directional type, containing some 20,000 feet of wire. The two steel masts, which are tubular, stand at the end nearest the sea, and are 264½ feet high to the extreme top. At a height of 250 feet they carry a triadic stay, from which the wires of the aerial run back in two groups of eight to stays supported by the wooden poles, which are somewhat lower. In erecting the steel masts an ingenious arrangement is employed which does away with the need for scaffolding. They are composed of semi-cylindrical sections, 10 feet long, and having longitudinal flanges by which they are bolted together to form complete cylinders, and which are placed alternately at right angles to each other; and they also have flanges at each end by which they can be bolted to their neighbours above and below. When one section has been put together a wooden pole is inserted in it and secured by a pin passing diametrically through the steel. The pole is then used as a derrick by which the next pair of segments is hoisted up, and when these

*An International Marconi Group at Poldhu.*

*Left to Right: M. Asensio (Spain); Mr. T. E. Hobbs, Engineering Dept.; Conde D. de Albiz (Spain); Mr. W. W. Bradfield, Manager; M. Travailleur (Belgium); Capt. Sankey, Director; Mr. G. Marconi, Mr. Godfrey C. Isaacs, Managing Director; Baron de la Chevreliere (France); Mr. Tegelberg (Hollana); Mr. A. Cohen, Publicity Manager; Mr. Vyvyan, Engineering Dept.; Mr. A. Gray, Chief Engineer.*

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have been bolted together in position round it it is raised and secured by a pin passing through the top of the completed section. The same operation is repeated for each succeeding section, and thus the work of erection can be effected very rapidly, the masts at Poldhu having been put up in four days.

Poldhu was formerly a sending station only, but now it has been adapted for the reception of messages also, and it will be able to communicate direct with Vigo and Aranjuez (Madrid), the newly-opened stations in Spain. Its capacity was severely tried on June 29th, when greetings were exchanged with other countries. Below are some of the messages sent from and received at Poldhu on that day :

From the Acting Premier of Canada, Mr. G. H. Penley, to the president of the Radiotelegraphic Conference, Poldhu :

" The Canadian Government present greetings to the President and members of the International Riadotelegraphic Conference, and feel sure that a conference between so many countries of the civilised world will be instrumental in increasing the sphere of influence of radiotelegraphy as a means of communication and of minimising disaster at sea."

To this the following reply was dispatched, in the absence of the President, by Mr. E. W. Farnall, Assistant Secretary of the Post Office, British delegate :

ACTING PREMIER, OTTAWA, CANADA.—On behalf of President, and in name of delegates, express hearty thanks to Canadian Government for message of encouragement and goodwill."

From Mr. J. L. Hazen, Canadian Minister of Naval Affairs, aboard the steamship " Royal George," to the manager at Poldhu.

" Please convey my heartiest greetings to International Radiotelegraphic Conference, and best wishes for successful conclusion of deliberations."

To this the following message was sent in reply :

" Mr. Marconi thanks Minister of Naval Affairs for his considerate and encouraging message.—G. MARCONI."

Mr. Charles Nagel, Secretary of Commerce and Labour, Washington, sent this message to the American delegates :

" On behalf of the President of the United States extend to you and your colleagues best wishes for the success of the conference in promoting the regulated use and orderly progress of radio-communication."

The following reply was sent by Dr. A. G. Webster :

" American delegation appreciates good wishes. By courtesy Marconi Company, expresses to President Taft great success of Radio Conference in promoting international good feeling.—WEBSTER."

From Mr. Beekman Withrop, Acting Secretary United States Navy, the following was received :

" To the American delegates, Poldhu.
" Through courtesy Marconi, by agency his genius has given world, Navy Department sends greetings to delegates London Radio Conference. America confident that regulation of radio will be wisely advanced by this conference."

Mr. John Bottomley, Vice-President of the Marconi Wireless Telegraph Company of America, transmitted the following to Rear-Admiral Edwards, one of the American delegates :

" Congratulate most heartily American delegation on work done in Convention, especially splendid suggestion Willis Moore duly accepted. American company stands ready co-operate every way with Department to carry out regulations."

Col. J. Garcia sent the following message to the President of the Council of Ministers, Madrid :

" Delegados Espana conferencia radiotelegrafica desde estacion de Poldhu Saludan respectuos amente V. E. rogandole eleve S. M. testimonio adhesion."

Mr. Marconi to the Minister of Marine, Rome :

" Sono lieto alla presenza delegati internazionali e rappresentanti Marina Italiana di rivolgere mio saluto V. E. Questo giorno ove opera Italia e specialmente marina per radiotelegrafia Viene da tutti riconoscinta prego gradire miei sentimenti riconoscenti inrieme a ministro guerra e Poste Telegrafi."

To General Brusati, at the Quirinale, Rome, Mr. Marconi dispatched a message as follows :

" Prega in Questo Giorno riunione delegati internazionali presso prima stazione ultapotente trasmettere a S. M. il re miei devoti omaggi."

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# The New Marconi Works at Chelmsford

## Description of the Equipment

THE structural features of the new Marconi works at Chelmsford have already been described in THE MARCONIGRAPH, but no reference has yet been made to their equipment. All who have visited these works, who have assured on this point. The technical press have evinced considerable interest in the new Marconi works, and have published articles concerning them. In the *Times Engineering Supplement* there appeared an excellent account

*Conference De'egates in the Machine Shop at Chelmsford on June 22nd.*

witnessed the various operations carried on there, and have observed the conditions under which the employees perform their daily tasks, have been struck with admiration for the hygienic and cheerful atmosphere which pervades the spacious building, and for the modern features of the equipment. No pains have been spared to provide and equip such works as would guarantee the excellence and efficiency of the apparatus produced, and no one who has inspected them has failed to be of some of the features of these works, of which we present the following extracts.

### Equipment of the Shops

Commencing our tour with the mounting shop, the visitor will note the neat and orderly arrangement of a large number of benches in continuous rows, and a few small machines driven through a line shaft by a 4-h.p. motor. This shop communicates with the finished-part stores by a window and has a door-

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way to the finished stores, while opening out of it is a special mounting shop for secret work, with its own benches, machines, and motor-driven shaft. In the condenser and winding shop there is a vacuum cleaner driven by a 6-h.p. motor for use in connection with a vacuum drying plant, from which pipes are run to all parts of the shops and offices with sockets for flexible suction hose. This equipment was supplied by the British Vacuum Cleaner Company. The equipment includes power is derived from three 15-h.p. Crompton motors. Counter-shafts on ball bearings are used for stopping and starting, with ball-bearing loose pulleys. A motor-driven Sturtevant exhauster is installed with an underground suction duct to a metal saw and two grinders.

The carpenters' shop contains the usual machines, which are driven through an underground shaft by a 15-h.p. Crompton motor. A Sturtevant exhauster is connected to three

*The Mounting Shop.*

a number of small winding machines driven through two line shafts by 4-h.p. and 2-h.p. motors respectively, and there are three ovens by Messrs. Fletcher Russell & Co., heated by town gas, for enamelling and baking windings of various kinds.

Alternate lines of machines and benches are to be found in the machine shop, a large number of lathes, drills, and grinding wheels being installed, including seven Ward capstan lathes. The machines are driven by three line shafts extending from end to end of the shop, for which sand-papering machines. Opening out of this shop are rooms for tinsmiths and riggers. Two coke-fired heating boilers by the National Radiation Company are installed, and there are six separate low-pressure hot-water circuits, in which circulation is ensured by motor-driven pumps in duplicate.

The stores throughout are fitted with racks, having wooden frames and shelves resting in loose angle irons at each end, these angle irons being provided with dowell pins for insertion into holes in the uprights.

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Several iron bins made by Messrs. Estler Brothers are provided for the storage of bolts, castings, etc.

**The Power House**

In the power house steam is supplied at 200-lb. pressure by two Davey Paxman Economic boilers with superheaters which give an extra 200° F. The two feed pumps, by Messrs. J. P. Hall, of Peterborough, are of the direct acting type, and a Boby water softener is installed with a reagent mixer driven by a 2-h.p. Crompton motor. The engine-room contains two 150-kw. dynamos at 220 volts driven at 1,000 r.p.m. through 10 to 1 helical reduction gear by De Laval steam turbines, flexible couplings of the stud and rubber bush type being used between the dynamo and slow-speed shaft. The Körting multiple jet ejector condensers are fixed below the floor, circulating water for them being supplied by centrifugal pumps in duplicate direct coupled to 7½-h.p. motors. A 10-kw. turbo-generator driven through 10 to 1 gearing at 2,400 r.p.m. of a similar type, but exhausting to atmosphere, is provided for emergency lighting and for supplying current to the circulating pump motors before the large sets are started up. The whole of this equipment was supplied by Messrs. Greenwood & Batley. The main switchboard is of enamelled slate by Messrs. Ferranti, and is fitted with aluminium busbars. In addition to the machine and circuit panels containing the usual fittings (including meters to the circuits), there is a panel for running both large machines in series to give 440 volts and a ground-leakage detector panel. There is also an alternating current panel for connection to the town mains. A distribution board by Messrs. Whipp & Bourne, containing fittings for four d.c. motor circuits, six lighting circuits, three a.c. motor circuits, and a circuit breaker for external arc lighting, is situated

*The Condenser and Winding Shop.*

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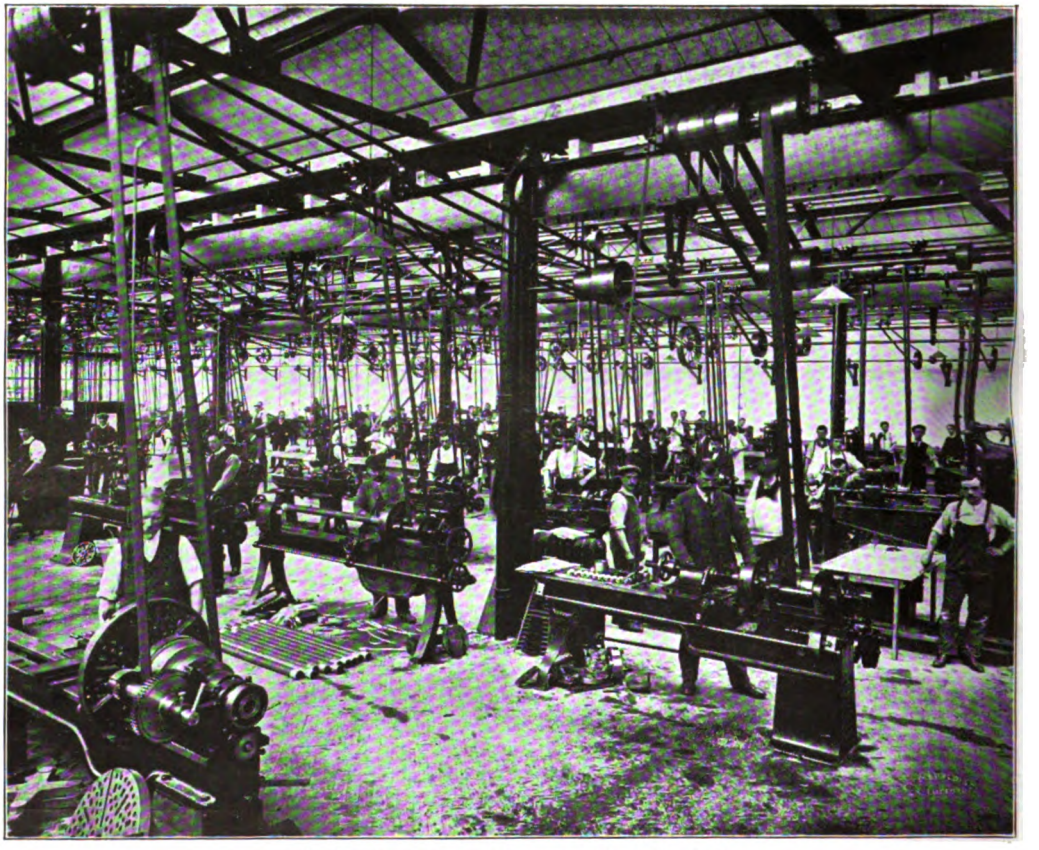
in the raw stores, the supply cables being brought from the power house under the railway siding in 3-in. pipes.

The deep well-pumping machinery consists of a bucket pump having its working barrel 150 ft. below ground level and with the weight of the rods balanced. The pump belt is driven by a 7-h.p. motor through one intermediate shaft, from which the crank-shaft is driven by gearing. The whole of this plant was supplied by Messrs. C. Isler & Co.



*The Machine Shop, View from the West End.*

The benches used throughout have wooden tops about 2 ft. 6 in. wide supported by cast-iron standards, the front planks being of hard wood 3 in. thick, while the back planks, although at the same level, are only 1 in. with a batten 3 in. deep fixed on edge at the back. A lock-up drawer with a special key is provided for each man, and there is a master key which fits all locks. All the line shafts are mounted on Hoffmann ball bearings with patent hangers, while wrought-iron split pulleys are used with Hendry belts. Artificial lighting is by 100-c.p. metallic filament lamps on separate overhead circuits carried in steel tubing, the power mains being paper-insulated, lead-covered cables run underground in 2 in. gas barrel. The doorways and stores' serving windows throughout the works are protected by fireproof doors of the sliding type, but hung upon overhead rollers running on inclined rails, the inclination having a tendency to close the doors. This tendency is overcome by weights hung upon ropes which pass over sheaves to the ends of the doors, where a connection is made by a fuse with a melting temperature of 150° F.; hence, if a fire should occur the weights would drop off and allow the doors to run home down their inclines. These doors, together with the Grinnell sprinkler equipment, were supplied by Messrs. Mather & Platt. A synchronome electric clock is provided in each shop.

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# Engineers at Chelmsford

MEMBERS of the Junior Institution of Engineers, of which Mr. G. Marconi is this year's president, paid a visit to the Marconi works at Chelmsford on July 12th.

The visitors arrived at noon, and were taken in parties over the works. At half-past one luncheon was served in the dining-room, Capt. H. Riall Sankey occupying the chair. The Chairman expressed regret at the unavoidable absence of Mr. Marconi, who was in Ireland. He welcomed the members of the Junior Institution of Engineers to the works.

Mr. W. T. Dunn said it was his privilege, on behalf of the Institution, to express their thanks to the company for allowing them to visit the works. It was a matter for intense regret that their president was not with them, and he was sure that that regret was also felt by Mr. Marconi. He proceeded to refer to the increasing usefulness of wireless telegraphy, and said, after the experiences in connection with the foundering of the "Titanic," the human race were deeply indebted to Mr. Marconi for his invention. In some people's minds, he continued, there was a doubt as to who was the inventor of wireless telegraphy. It was true that others had worked in the field, but Mr. Marconi could be regarded as the inventor of the wireless telegraph system. Some of them who saw the magnificent fleet at Spithead had their hearts stirred. It was necessary that the Navy should be upheld in order to maintain the integrity of the Empire, but it was also important that there should be ready means of inter-communication between the different parts of the Empire. He would like to send the following Marconigram to their president:

"The members of the Junior Institution

*Another View of the Machine Shop.*

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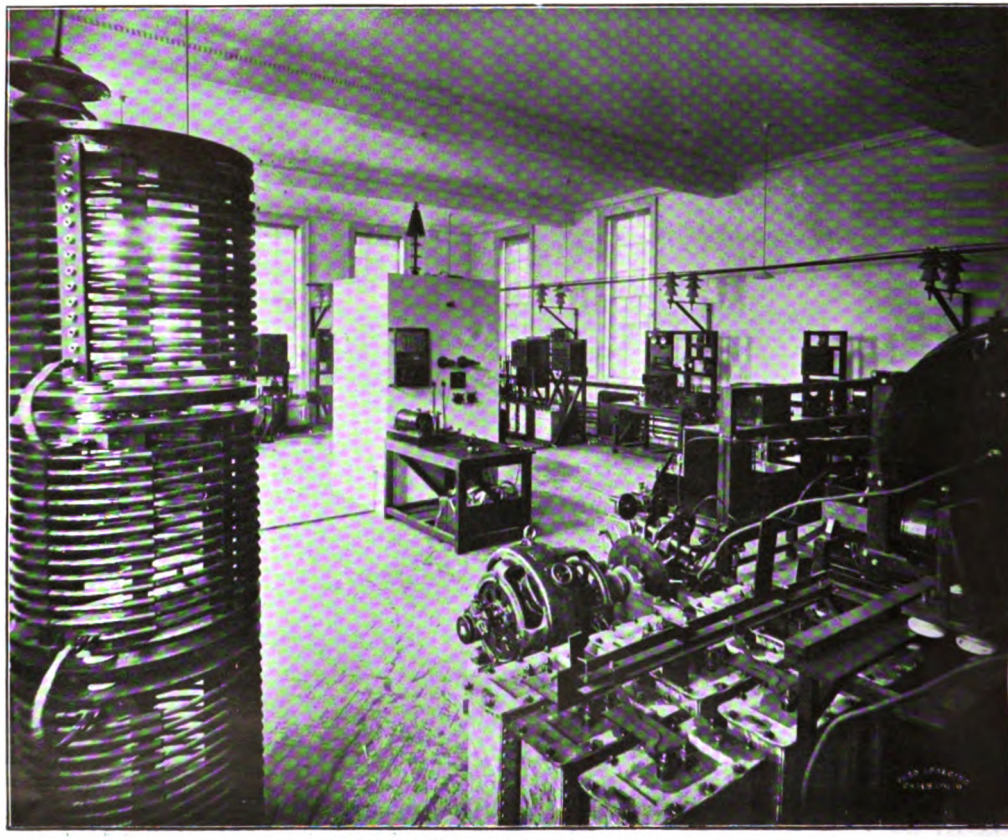

*General View of the Show Room.*

of Engineers desire to offer you their respectful and hearty congratulations on visiting the new Marconi works, and wish you continued and increasing success."

In concluding, he proposed the health of the chairman.

Capt. Sankey, in replying, said he would convey their good wishes to Mr. Marconi, and he also thought their Marconigram could be forwarded to him. They were not on speaking terms with Clifden, but they were with Poldhu, and the message would be transmitted from that station to Mr. Marconi. He then gave a brief account of the principles of wireless telegraphy, which was followed with ease by his hearers through the clear mechanical analogies which he described. The visitors afterwards resumed their inspection of the works, and saw demonstrations in wireless telegraphy from some of the large sets and also from a field set. Messages were exchanged with Poldhu and Mr. Marconi at Clifden.

Tea was served during the afternoon, and a pleasant and instructive visit terminated with votes of thanks to Capt. Sankey, Mr. C. Mitchell, the works manager, and Mr. Dowsett.

*Witnessing a Field Station Demonstration at Chelmsford.*

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# An Impression of the Marconi Works

**By a Lady Visitor**

DURING the visit of the Junior Institution of Engineers to the works of the Marconi Company, the statement was made that one of the ladies present was willing to record her impressions. This was a rather liberal interpretation of a desire not to be disobliging, when persuaded that a few lines from a feminine pen were really wished for. To inflict probably quite uninteresting thoughts upon unwary readers was not a thing one felt desirous of doing. Having sounded this note of warning, it may be said that the chief impression was, perhaps, that the Marconi Company was to be congratulated upon the ability to dispense, to both mind and body, hospitality of such quality as was enjoyed by those present on that occasion. One could not but reflect, whilst enjoying the "rare and refreshing fruit" at luncheon, that the fare provided for our mental digestion was of even daintier description, embodying as it did one of the most wonderful fruits of man's endeavour.

There could be but one impression made on all minds by the airy, light, and roomy workshops, and by the refinement of the dining and recreation rooms. Obviously, the lines of the employees of the Marconi Company had fallen in pleasant places, and one could but wish that all workers in factories could earn their bread under similar conditions.

Captain Sankey speedily dispelled the disappointment felt at the unavoidable absence of the President, Mr. Marconi, and the explanation he gave of the principle of wireless telegraphy was, even to the lay mind, quite lucid. But, to eyes unaccustomed to workshops, the multitude of detail and the patient, perfect workmanship that go to make up the complete apparatus, were things to marvel at and to admire unreservedly.

It was felt that, should women ever enter the field of electrical engineering, which to the best of the writer's knowledge they have not yet done, it would take many years for them to become accustomed to thinking in coils and wheels, as it were. However, with women chauffeurs and aviators already with us, very probably time will show this impression to have been quite erroneous.

Personally, one felt that it was preferable not to have to deal in daily work with anything so weird and impalpable as electricity. It was a relief to watch the spark gaps and feel that here was something visible and audible, though far from tangible.

Women are credited, as a rule, with greater faith and imagination than men; but to one at least it seemed almost unbelievable that the solitary and bare-looking mast erected in the grounds represented an actuality of great commercial value, and of such importance to the lives of men as was proved to be the case in the late unforgettable tragedy of the sea.

This may have been due to the fact that the writer, owing to her connection with electric telegraphy, to which reference was made during the day, had used, as toys in childhood, sections of the very solidly realistic shore-end of the first Atlantic cable. It was perhaps but natural that it should add to the pleasure of an entirely delightful visit to know that one's forebears had, by their pioneer work in compelling electricity to the service and uniting of mankind, laid the foundation of the great achievement upon which Mr. Marconi's wonderful inventions have set the coping stone.

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In the House of Representatives, Melbourne, on July 17th, Mr. Tudor moved the second reading of the Navigation Bill passed by the Senate last year. The new provisions include compulsory boat drill, wireless installation, etc.

* * * *

The Conference report on the new wireless telegraph law requiring that operators shall be provided for constant duty has been adopted by the House of Representatives at Washington. The Bill now only requires President Taft's signature.

* * * *

A list of wireless telegraph stations of the world has been published by the United States Government. This publication runs into 165 pages, and contains the names of ships, location of stations, call letters, range in nautical miles, power in kilowatts, wave-length in metres, and character of station. There is also an alphabetical list of call letters. Copies of the publication can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D.C., at a cost of 15 cents each.

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The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

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**PORTRAIT OF MR. PHILLIPS.** The Publisher begs to announce that he has arranged to supply portraits of the heroic Marconi Officer who lost his life as a result of the "Titanic" disaster at the following prices: Cabinet size, 1/9 each; Enlargements, 10 in. by 8 in., 13/-; 12 in. by 10 in., 14/-; 15 in. by 12 in., 17/6 post free. The portrait is by Miss J. Stedman of Farncombe, and is the same as that from which the illustration in the May number of THE MARCONIGRAPH was made.

### The Share Market

The market in the various issues continues a fairly active one, although the prices have suffered from the general industrial depression of the past month. The share markets are generally idle for the holiday season, but the investment interest in the Marconi issues is maintained, and inquiries continue from all parts of the world.

The prices as we go to press, on July 24th, are; Ordinary, $5\frac{7}{16}$; Preference, $4\frac{1}{16}$; Canadian, 24s. 6d.; Spanish, $1\frac{3}{16}$; American, $1\frac{3}{4}$.

### Share Warrants to Bearer

Marconi's Wireless Telegraph Co., Ltd., give notice that the following dividends will be payable on and after August 1st, 1912:

On the 7 per cent. Cumulative Participating Preference Shares—A final dividend for the year 1911 of 10 per cent., being 2s. per share, less income tax at 1s. 2d. in the £. Coupon No. 5. An interim dividend for the year 1912 of 7 per cent., being 1s. $4\frac{4}{5}$d. per share, less income tax at 1s. 2d. in the £. Coupon No. 6.

On the Ordinary Shares—A final dividend for the year 1911 of 10 per cent., being 2s. per share, less income tax at 1s. 2d. in the £. Coupon No. 3. An interim dividend for the year 1912 of 10 per cent., being 2s. per share, less income tax at 1s. 2d. in the £. Coupon No. 4.

Coupons may be lodged at the head office of the company, Marconi House, Strand, London, W.C., and must be left four clear days for the purpose of examination and preparation of dividend warrants.

Coupons will also be payable at the following places, at the exchange of the day:

Banca Commerciale Italiana, Milan, Rome, Genoa, Turin, Venice, Leghorn, Naples, Bologna, Florence, and Palermo.

Banque d'Outremer, 48, Rue de Namur, Brussels.

Hanover National Bank, New York.

Mendl & Co., 383, Bartolome Mitre, Buenos Aires.

The necessary forms for lodging coupons may be obtained from any of the above addresses, or from the office of the company: Piazza San Silvestro 74, Rome; Cie. Française Maritime et Coloniale de Telegraphie sans Fil, 35, Boulevard des Capuçines, Paris; The Marconi Wireless Telegraph Co. of Canada, Ltd., 86 Notre Dame Street, Montreal.

"E 5," the largest submarine yet put in the water, was launched for the British Navy at Barrow. She has all the latest improvements, including wireless telegraphy.

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### Portuguese Contract Ratified

The provisional contract entered into between the Government of the Portuguese Republic and Marconi's Wireless Telegraph Co., Ltd., for the erection of wireless telegraph stations in Portugal and Portuguese possessions has now been ratified by the Parliament, and considerable extensions made therein. Particulars of the provisional contract were published in the April issue of THE MARCONIGRAPH, and it will be remembered that the contract provided for the erection and installation of five radio-telegraph stations. Efforts were made to delay the ratification of this agreement, and several inspired attacks appeared in some of the newspapers. A discussion on the question took place in the Portuguese Parliament early in June, when the Prime Minister made a full reply to the unfounded attacks which had been levelled against the Government and the Marconi Company. The Prime Minister stated that the decision to adopt the Marconi system was only arrived at after the whole question concerning wireless telegraphy had been most carefully studied. The choice of a system was guided by scientific, technical, and commercial considerations. A member of the Portuguese Parliament who had shown some opposition to the ratification of the contract thereupon stated in the House that the explanation given by the Prime Minister was satisfactory, and all opposition was withdrawn. The range of some of the stations is to be increased and additional stations are contemplated.

### Further Developments in America

Following the absorption by the American Marconi Company of the United Wireless Company comes the interesting information of the acquisition by the same company of the property of the Massie Wireless Telegraph Company. In accordance with this arrangement certain ship and shore stations pass into the possession of the Marconi Wireless Telegraph Company of America. These stations include two on Cape Cod—namely, Cape Cod (which must not be confused with the well-known Marconi station at South Wellfleet, Cape Cod) and Chatham—Block Island, at the mouth of the Long Island Sound, Point Judith (Rhode Island), Narragansett (near Newport), New London (Connecticut), and Wilson Point. These stations are available for reporting purposes and communication with vessels using the Long Island Sound.

The installations on three ships owned by the Montauk Steamship Company and the installation on the "Tasco" owned by the Scott Towing Company, together with certain apparatus constructed by the Massie Company, have also passed into the possession of the American Marconi Company. These developments are calculated to still further advance the Marconi interests in the United States.

### Lantern Lectures on Wireless

Wireless telegraphy is likely to be a very attractive subject for lectures during the coming season, and in order to help technical institutions, colleges, literary and other societies, as well as lecturers, we have prepared a wide range of lantern slides covering all aspects of wireless telegraphy: the scientific, the engineering, and the popular. There has been a great demand for these slides during past years, and on every occasion where they have been used they have been very highly appreciated. We have considerably increased the number of slides available for the coming season and we are prepared to supplement these by furnishing appropriate readings to accompany the slides. Further information respecting these slides will be published in the next issue of THE MARCONIGRAPH. In the meantime we shall be pleased to receive applications for the loan of any number of slides, which we shall be happy to supply free of charge.

### The Phillips' Memorial Fund

The appeal made in last month's MARCONIGRAPH for donations towards the fund which has been opened for the establishment of a memorial to the late Mr. J. G. Phillips has met with a gratifying response. We have received amounts reaching a total of £38 5s., the donations coming from several countries. Since then a sum of £20 has been received from the Compagnie de Télégraphie sans Fils, Brussels, and 200 francs from the Compagnie Française Maritime et Coloniale de Télégraphie sans Fil, Paris. The memorial is to consist of a drinking fountain, to be erected in the borough of Godalming—Mr. Phillips' native town. The amount required is £500. The fund was inaugurated by the public authorities of the Borough of Godalming and the County of Surrey, and all sums received by us will help to increase that fund. Although the response to the appeal has been generous, a considerable sum is still required to enable the committee to carry out their schemes and we make this further appeal to our readers to send in donations. The memorial is in no sense a local one, as is testified by the fact that donations have already been received from all parts of the world.

### The O'Driscoll Fund.

We have received a gratifying response to the appeal for the above fund, which now amounts to £33 5s. 6d. Amongst the subscriptions received this month is one for £6 7s. 6d. collected at the Liverpool school. A cheque has been sent to Mrs. O'Driscoll, who has expressed her gratitude at the way in which her husband's memory has been honoured by his late colleagues. The fund is, however, not closed, and we shall be glad to receive any further subscriptions.

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# Wireless Company's Annual Meeting

## A Successful Year. Future Prospects Outlined

*A Verbatim Report of the Proceedings at the Annual Meeting of the Company will be sent on application.*

THERE was a large attendance of shareholders at the annual meeting of Marconi's Wireless Telegraph Co., Ltd., at the Whitehall Rooms on July 9th, who had gathered in anticipation of a favourable statement from the Chairman. Nor were they disappointed, for from start to finish of the very detailed analysis of the position submitted by Mr. Marconi there was not one note of pessimism; on the contrary, his tone became more and more buoyant as he proceeded and as he enumerated the particular points to which the directors attach importance. In the first place, Mr. Marconi stated that while wireless telegraphy, and the Company's business in particular, made great strides during 1911 as compared with 1910, "the increase of business for 1912 promises far and away to exceed the ratio of increase of 1911 over 1910."

### Success of the Subsidiary Companies

It was natural, he added, that with the universal recognition of the great value and utility of wireless telegraphy the success of the associated companies should follow closely on the heels of the parent company. There was, for instance, the Marconi International Marine Communication Co., Ltd., in which the wireless company held over 200,000 fully-paid shares out of a total issued capital of about £204,000, of which the receipts from ships' telegrams, news service, traffics, ships' subsidies, etc., increased from some £40,000 in 1910 to £64,000 in 1911, an increase approximately of 60 per cent. The profits for the year showed an equally satisfactory improvement. The business, however, of 1912 promised even a greater proportionate advance, and that company's organisation had so extended that its business could not help showing substantial and rapid further development. The dividend which that company would pay for 1911 should indicate the progress over the preceding year. Mr. Marconi said he regarded the shares held in the Marconi International Marine Communication Co., Ltd., as one of the most valuable assets to-day, and one which would surely materially improve year by year. The business of the Belgian Company, the French Company, and the German Company for last year had been satisfactory. All had paid dividends, and they look for substantial development in each of them in the ordinary course of things. The Spanish Company was now doing a big business, both in ship and shore telegraph service, and also as a telegraph company conducting a regular telegraph service between the Canary Islands and Spain. Arrangements were in course for substantial extension of that telegraph service to other countries, and he hoped that the day was not far distant when the public would be able to send telegrams to both Spain and the Canary Islands, via Marconi, from every British post office throughout the United Kingdom. The Russian Company was doing a very substantial and satisfactory business. It had already obtained orders from the Russian Government for considerably over one million roubles, and was negotiating for further business of a very extensive and important nature. He contemplated that St. Petersburg, where there were extensive freehold works, would become a very important centre for the development of wireless telegraphy over the vast territory to the East, where very little in the shape of telegraphic communication yet existed.

### Transatlantic Wireless

Mr. Marconi went on to state that the Canadian Company was making good progress, and the directors were informed that "a further agreement of importance has been come to with the Canadian Government, which awaits the return of the Ministers, who are now visiting this country, to be completed and signed." The Transatlantic service had shown considerable improvement during the past year, and traffics showed a marked increase. He reminded shareholders that they were now able to send a telegram from any of H.M. telegraph offices throughout the United Kingdom to any part of Canada and the United States, via Marconi, at 4d. per word less than cable rates, and deferred messages could be dispatched equally from any offices at half this rate.

There had been delay in the progress of the Argentine Company, but a very able representative was visiting Buenos Aires at the present moment with the object of straightening out many matters, and he was glad to say that

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highly satisfactory reports had been received from him, and they could now look forward to substantial progress and development in that part of the world. He hoped to be able to give some further interesting information in this connection at not too distant a date.

### American Company's Prospects

Mr. Marconi devoted a considerable amount of time to a statement regarding the American Company, and it at once became evident that this enterprise is likely, in the near future, to play an important part in the forwarding of the Marconi interests on the other side of the Atlantic. Important and profitable as was the marine telegraph business carried on by the American Company, it was, said Mr. Marconi, dwarfed by the impending developments of the telegraph business which had been taken in hand, and to which the seven million dollars of new capital would be devoted. Everybody was acquainted with the immense commerce of the United States and the free use which was there made of the telegraph. They were satisfied that an excellent service would be furnished which would put the United States of America in communication by wireless telegraphy with this country, across the Pacific with the East, and south to many of the South American States, which he hoped in time would be extended to all of them. This service would be one of the most extensive, if not the most extensive, telegraph service in the world, and he left it to shareholders to form their own appreciation as to what was likely to be its worth. By reason of the agreement which the Marconi Company entered into with the Western Union Telegraph Company, and also the Great North-Western Telegraph Company, their service would be fed by the 25,000 telegraph offices which those companies possessed.

### The Imperial Scheme

Another point referred to by the chairman was that of the Marconi patents, and he was able to show in this connection that the Company had little to fear from the advent of fresh discoveries in connection with wireless telegraphy, for, in the first place, the Company itself was showing great energy and enterprise regarding this matter, and was always on the look out for fresh ideas. Even supposing, however, that a valuable invention were brought out by independent interests, it was highly improbable that one single patent would affect the position of the companies already established. Reference was made to the contract entered into with the British Government in respect of the Imperial wireless scheme, which provides for the construction of a number of high-power, long-distance stations, communicating over a range each of about 2,000 miles, in places which have been already defined, and at all such other places as may subsequently be required and agreed upon. A speed of 20 words a minute duplex, with ordinary working, or 50 simplex with automatic working is guaranteed. During the duration of this agreement the Marconi Company will receive 10 per cent. of the gross receipts derived from the service.

Mr. Marconi mentioned that the United States Government had decided to adhere to the Berlin Radiotelegraphic Convention, which would bring America into line with Europe in all matters relating to wireless telegraphy. Naturally, a reference was made to the Conference which had been sitting in London since the commencement of June, and had just completed its labours, and to the delegates who attended that important gathering Mr. Marconi tendered his congratulations on the results achieved.

### A Welcome Surprise

Mr. Godfrey C. Isaacs (the Managing Director), who seconded the report, announced that the Company has just received a telegram from Portugal advising them that the Portuguese Parliament had approved the provisional contract which they had entered into (THE MARCONIGRAPH, April, page 9), and had ratified it with considerable extensions. He further announced that the Company's representative in Bolivia had furnished them with the information that the Bolivian Government had accepted the Marconi Company's terms for the erection of some seven stations in Bolivia, and on conditions which were very satisfactory to the Company. Those two additional contracts would add very materially to the figures which the Chairman indicated in his speech.

There was a very brief discussion before the unanimous adoption of the report, and in the course of which Mrs. Henry Lee asked whether there was any possibility of a dividend being paid by the American Company in the near future. To this the Managing-Director, Mr. Godfrey Isaacs, replied that he anticipated " a very reasonable dividend " when the business recently owned by the United Wireless Company had been worked for twelve months. This concern, we may mention, was acquired as from March 31st last.

### The Dividends

The following motion was then unanimously carried : " That a final dividend for the year ended December 31st, 1911, of £10 per centum on the 250,000 cumulative participating preference shares be paid on August 1st, 1912, to

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the members who are on the register as present holders thereof; that a final dividend for the year ended December 31st, 1911, of £10 per centum on the capital now paid up on the ordinary shares be paid on August 1st, 1912, to the members who are on the register as present holders thereof."

The retiring directors (Major S. Flood Page, Mr. Henry S. Saunders, and Mr. Samuel Geoghegan) were re-elected, after which the chairman formally declared "That an interim dividend in respect of the year 1912 of £7 per centum on the 250,000 cumulative participating preference shares will be paid on August 1st, 1912, to the members who are on the register as the present holders thereof; that an interim dividend in respect of the year 1912 of £10 per centum on the capital paid up on the ordinary shares at this date will be paid to the members who are on the register as the present holders thereof."

The shareholders sanctioned the appropriation of a sum of money to divide among the staff as a bonus, and another sum to start a pension fund, after which the meeting, which was enthusiastic in character from the commencement, terminated with a hearty vote of thanks to the Chairman.

# The Marconi International Marine Communication Company, Limited.

THE annual report of the directors of this company, and the balance sheet and profit and loss account for the year ending December 31st, 1911, indicate the very satisfactory progress of the company's business during the year under review, the net profit for the year amounting to £15,027 15s. 7d., after deducting £7,600 for depreciation and allowing for debenture interest, as compared with £10,765 9s. 9d. in the preceding year. The revenue from ships' telegrams, traffic, subsidies, etc., amounted to £64,165 16s. 8d., showing a substantial increase over the sum of £40,535 15s. 8d. for 1910. The progress of the company is further indicated by the number of telegraph stations owned and worked by the company on board ships on the high seas, which has increased from 250 at the end of 1910 to 350 on December 31st, 1911, and stands at some 406 at this date. A list of the ships, exclusive of warships, which are equipped or are on order for equipment, is annexed to the report.

In order to meet the large and increasing demand for the installation of telegraph stations on board ships, 6,250 5½ per cent. First Mortgage Debentures of £20 each were created during the year, and the eighty 7 per cent. First Mortgage Debentures of £500 each were paid off.

The directors now recommend the payment of a dividend for the year 1911 at the rate of 7 per cent., which will absorb the sum of £14,283 18s. 5d., and to allocate the sum of £1,750 to the repayment of debenture account, leaving the sum of £2,612 2s. 10d. to be carried forward. The retiring directors are Captain H. Riall Sankey and Mr. Henry Spearman Saunders, who, being eligible, offer themselves for re-election.

The annual meeting of the company was held on July 31st.

The transfer books of the company were closed on July 29th, and will remain closed until August 11th inclusive.

## The Spanish Company.

The annual report of La Compania Nacional de Telegraphia sin Hilos opens with an historical account of the formation of the company. Reference is made to some of the events of the past year, including the inauguration of the central station at Aranjuez, near Madrid, in which the King and Queen of Spain took part, and which was attended by the Princess of Battenberg, members of the Government, the English and Italian ambassadors and many diplomats, naval and military officers, representatives of the Civil Service, and of the Spanish and foreign Press. Another important occurrence was the wreck of the "Delhi" on the coast of Africa, and the saving of its passengers and crew, in which the newly-opened station at Cadiz took a prominent part. Mention is also made of the considerable and valuable assistance which the Cadiz, Teneriffe and Las Palmas stations rendered on the occasion of the breakdown of the cable between the Peninsula and the Canary Islands. It has been decided to establish a school for the training of operators, and a site has been acquired in the vicinity of Cuatro Camison. Mr. Rodriganez, the president of the company and a member of the board, resigned his post on being appointed Minister of the Crown. The board agreed that Mr. Comyn should be appointed managing director of the company, and that the presidency should remain vacant for a certain time. General D. Jose de Bascaran and D. Jaime Macnaughton were elected members of the board.

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# The Effect of Daylight upon Radiotelegraphic Waves

By J. A. Fleming, M.A., D.Sc., F.R.S.

ONE of the unsolved problems on the theoretical side of radiotelegraphy is the full reason for the diminished range of it by day as compared with night. It is now well known, even to the general public, that a given transmitting and receiving apparatus has a considerably greater range of action during the dark hours of the night than during the full daylight. This phenomenon, discovered by Mr. Marconi in 1902, has been attributed both to an action of daylight on the sending antenna and also to a certain degree of absorption of the electric waves by the atmosphere when illuminated by sunshine. Neither of these explanations is entirely satisfactory. It was discovered by Hertz in 1887 that ultra-violet light which is present in the light from the electric spark or electric arc when falling on another spark gap facilitated the discharge so that the spark across that gap will take place at a slightly lower voltage. Subsequent investigations showed that ultra-violet light has a particularly strong discharging action when such light falls on a zinc surface negatively charged.

### The Lesson of the Solar Eclipse

Certain other metals, such as potassium, sodium, and rubidium, also lose an electric charge under the influence of ordinary light. Hence it was at least a permissible hypothesis to assume that the antenna, when charged, would during daylight lose some of its charge, and hence be raised to a less voltage than during the night. Another supposition made was that the action of daylight is due to the ionizing effect of daylight on the atmosphere by which it becomes to a certain small extent conductive, and therefore absorbs some of the energy of the electric waves passing through it. The recent occurrence of a solar eclipse, which was total at or near Paris, seemed, therefore, to offer an interesting opportunity to gain some further knowledge on this subject.

Since the darkness of a solar eclipse is localised to a small area, which is the cross-section of the conical shadow of the moon at or near its apex, then if this shadow should sweep across a radiotelegraphic station it is evident it will for a few seconds put the antenna in darkness, whereas the rest of the large area over which signals can be received is in full daylight. During a recent visit to Paris I obtained from the French authorities permission to visit the Eiffel Tower radiotelegraphic station, and asked M. Ferrié, the eminent radiotelegraphist in charge of the station, what effect on the signals was produced by the eclipse. He told me that a slight increase in strength of the signals had been noted at the time of totality. This result agrees with certain observations of Dr. Eccles in England. One would need to be able to command the services of a good many prolonged total solar eclipses to make all the control experiments necessary to settle how far the effect is due to an action on the antenna itself and how far it is due to an action on the surrounding air.

### Conductivity of Air

We can, however, make measurements of the conductivity of the air near the earth's surface and at higher levels. Nevertheless, the results are not altogether such as enable us to definitely settle the question of the influence of ionic conductivity in the air.

To take a simple case: suppose a plane electromagnetic wave to be advancing through the air with its plane vertical to the earth's surface. Let $s$ be the conductivity of the air in electrostatic units per centimetre cube, and let $r$ be the corresponding resistance in ohms per centimetre cube. Let $K$ be the dielectric constant. Then, starting from the fundamental equations of the electromagnetic field, it is not difficult to prove that at a certain distance the waves will be reduced in amplitude in virtue of energy absorption to an extent which will reduce it to 36·8 per cent. of its value at the sending station. The reason for taking this particular percentage is because the fraction ·368 is equal to $1/e$ where $e$ is the base of the Napierian system of logarithms, and it facilitates calculation.

Now, it is not difficult to prove that when the conductivity of the medium is small such plane waves are reduced to $1/e = 36{\cdot}8$ per cent. of their initial strength in travelling a distance in centimetres equal to $r\sqrt{K}$ divided by 188·5, where $r$ is the specific resistance in ohms of the medium per centimetre cube and $K$ is the dielectric constant. Let us take the case of air for which $K = 1$, and in the first place investigate the absorption if we assume the air to have a specific resistance of 10,000 megohms per centimetre cube. Then $r = 10^{10}$.

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ohms, and the critical distance is $10^{10}/188{\cdot}5$ centimetres, or nearly 500 kilometres. In this distance, then, the plane wave would be reduced in amplitude by absorption to nearly one-third of its initial value, apart altogether from any other causes of weakening, such as diffusion, or by the earth's surface. As a matter of fact, such measurements as have been made of the atmospheric conductivity near the earth's surface do not give anything like so small a value. Professor Zenneck has given, as the result of H. von Gerdien's measurements, a value nearly 100,000 times greater—viz., about 1,000 million megohms. If the conductivity of the air during the day at or near the earth's surface has anything like the latter value, then it is clear that ionic conductivity will not account for the daylight effect. Again, there is clearly an influence of wave-length upon the phenomenon, since certain wave-lengths at certain times are found to be more penetrating than others.

### The Analogy of Sounds

It is, however, quite possible to frame a third hypothesis which may be found to have a basis of fact.

It is well known that sounds are better heard when the wind blows with the direction of the sound than when against it. The true explanation of this was given many years ago by the late Sir George Stokes. When wind is blowing along the surface of the earth the wind velocity is generally less close to the earth than at higher levels. Hence, if a plane sound wave is travelling against the wind, the upper parts of the wave front travel more slowly than the lower. Hence the wave front is tilted backwards, and the direction in which the sound travels, being normal to the wave front, is tilted upwards. Hence the greater part of the sound wave passes right over the head of the observer, and he hears less sound. I have applied the same kind of reasoning to electro-magnetic waves. If we imagine a plane vertical wave advancing through the air, all parts would travel at the same speed, and the direction of the ray would be horizontal. If, however, any cause, such as ultra-violet light, ionizes the upper portion and condenses on the ions atmospheric moisture, then it is quite possible the dielectric constant of the upper region may be greater than that of the air near the surface. If this is the case, the upper part of the wave front will travel more slowly than the lower, and it will be tilted backward, and the direction of the ray or normal will be tilted upward. Hence at a distant receiving station the greater part of the wave may pass right above the receiving antenna and so weaken the signals.

Accordingly the loss of range in daylight may not be due to conductivity produced by ionization, but to increased dielectric constant in the upper atmosphere.

It has been pointed out by Sir J. J. Thomson that air exposed to ultra-violet light may be regarded as filled with minute water particles condensed on the ions. This suggests that perhaps even the blue of the sky, generally now attributed, on the authority of Tyndall and Lord Rayleigh, to dispersal from small particles, may not, at least, in part be due to such molecular groups.

### Daylight Effects

Professor Zenneck states that he has not found that air filled with water cloud has a higher dielectric constant than pure air. I am at present engaged on experiments which have for their object to investigate this question more closely. If it should turn out that the action of ultra-violet light upon air containing moisture is to increase its dielectric constant by even one or two parts in a thousand, it would provide a basis for the above hypothesis, which would enable us to explain the effect of daylight on long-distance radiotelegraphy without assuming any increase in conductivity. One of the notable peculiarities which call for explanation by any valid hypothesis is the well-known depression in the signalling-intensity curve at or about dawn. If a diagram is drawn, showing the disposition of the earth's shadow with regard to air antenna at the boundary, it will be seen that we have just the arrangement which is most favourable to such an uptilting of the transmitted waves, provided that the part of the wave front travelling in sunlit air moves more slowly than the part travelling in darkness. Before, however, we can safely theorise on this matter we require far more extensive measurements than have yet been made of the atmospheric conductivity at various levels and times of the day, and also of the dielectric constant of air under the influence of ultra-violet light.

Some of these matters are at the present under investigation in the radiotelegraphic laboratory at University College, London.

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The master of a village school in Northamptonshire has erected a small wireless set at the school. This was referred to in a letter by a youthful pupil, who states that the wires have been fixed to the summit of the tallest elm tree on the school close, some 80 ft. high. Most of the children know the Morse code; and the youthful writer hopes that "one day some Bugbrooke boys will become Marconi operators, and will rival the gallant operators who have saved so many hundreds of people from drowning."

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## Atlantic Airship Explosion

IN the November issue of THE MARCONIGRAPH there appeared an article by Mr. Jack Irwin, who was operator on the airship "America," which was the first air vessel to attempt to cross the Atlantic. The story of the "America" and its ill-fated voyage was described by Mr. Irwin, who mentioned that he was offered the position of Marconi operator on Vaniman's new airship, the "Akron," in which another attempt would be made to reach Europe by dirigible balloon. The "Akron" was completed in September last, and had a maximum length of 258 feet, while its capacity was 400,000 cubic feet, the gas being contained in two small balloons, one forward and one aft. Under the car, 185 feet long, was a tank capable of carrying 8,000 gallons of petrol, and beneath this again was a lifeboat. The weight of the car was 6,000 lbs. The airship carried two motors, one of 110 H.P. and one of 80 H.P., as well as an auxiliary of 17 H.P. There were six propellers, three on either side. It was also intended to carry a 3-kw. Marconi set of special construction.

In full view of thousands of spectators on the beach at Atlantic City on the morning of July 2nd the "Akron" exploded, burst into flame, then fell into the sea with its car and crew of five, including Mr. Melvin Vaniman and his brother Calvin. All were killed. Mr. Irwin was not on the airship at the time of the disaster. The precise cause of the accident possibly never will be known. It was believed that no spark from the engine-room, which was encased in asbestos, could reach the gas envelope, which had been specially constructed, and could hold its contents without any material leakage for thirty days. Spectators say that the "Akron," which at first seemed to be under perfect control, suddenly shot upward at a terrific speed as the sun's rays expanded the gas, and the explosion followed. The huge airship was launched at 6.15 a.m. on July 2nd, and this was to have been the final trial before she attempted a flight across the ocean. Her first trouble was experienced when attempts to take water on board for ballast proved a failure. The airship started to mount steadily. It appeared that Mr. Vaniman and his men were fighting hard to bring her down, but she failed to respond. The disaster occurred at about 6.30 at an altitude of from 1,000 to 2,000 feet, and half a mile from the shore.

*Mr. Jack Irwin, the Wireless Operator on the Transatlantic Airship.*

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Several determinations of longitude have of late been made by means of wireless messages, but the most ambitious attempt of this nature has just taken place between Paris and Tunis, wireless signals connecting two clocks, one at the Eiffel Tower and the other at Bizerta, Tunis, the comparison of which decided the longitude. The signals travelled the whole distance in 0.007 second, which works out at nearly 200,000 miles a second. When Sir George Airy (Astronomer-Royal) determined the longitude of Valentia, the little island off the coast of Kerry, he had no fewer than thirty chronometers carried backwards and forwards between Valentia and Greenwich Observatory twenty-two times before he was satisfied.

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# An Indivisible Navy

*The following extracts from an article in the "Times of India" will be read with interest, in view of the completion of the Imperial scheme of wireless telegraphy. Some of the claims made have been satisfied since the article was written, but this does not detract from its interest.*

THE Eastern waters are most inadequately provided with wireless stations, although two years ago Mr. Asquith, replying to the Indian Delegation at the Imperial Press Conference, who pressed this point, gave the assurance that the question should receive early attention. Then not only are the stations in Eastern waters too few, but they are of inadequate power. In establishing them the standard accepted has been the maximum distance over which shipboard installations can be secure of transmitting messages—namely, three hundred miles. The gap between Bombay and Aden may be taken to illustrate this point. The shore stations at Bombay and Aden have a guaranteed radius of three hundred miles. That is to say, if there are not ships equipped with wireless scattered over this route, the shore stations are useless till such ships come within range and complete the chain.

### An Eastern Link

Not only then have the stations in the East to be numerically increased, but their range has to be improved until all gaps are bridged without dependence on the chance of intervening ships. Nevertheless, the use of wireless in the Navy has made such giant strides that it has effected a revolution in naval strategy not inferior to that wrought by the universal adoption of steam.

Before Mr. Marconi made his discovery one of the great problems of naval strategy was the maintenance of communication between the Fleet commander and the units of his command. The invention of smokeless powder and the advance of visual signalling were only palliatives. Until wireless telegraphy became general in the Navy it is not exaggerating to say Fleet commanders realised that once action became general, they could not hope to maintain control over fleet units. But wireless telegraphy solved the problem at a step. Its merits were at once appreciated by the Admiralty, and although we are accused of being a conservative people, the British Navy is years ahead of any of its rivals in the utilisation of this great engine of war. A unity of control and purpose in British Fleets has been attained undreamt of a decade ago.

From Fleet unity to unity between Fleets was a longer step. Through the increasing efficiency of wireless installations and the establishment of a powerful installation at the Admiralty buildings in Whitehall, all the squadrons operating in Home and adjacent waters were brought into direct harmony with the directing brain. The process of extension, until these conditions become world-wide, has now been commenced. The incalculable influence of this development on grand strategy is

### A Strategical Centre

at once apparent. The whole naval force of the Empire will be capable of being directed on the strategical centre, and no important units ought to be for an hour out of touch with the progress of the war. Indeed, it is not saying too much to assert that a degree of unity will be secured throughout the naval forces of the Empire, whether they be in Home waters, the Atlantic, or the Pacific, far transcending that obtaining in a huge land force. From this development the British Empire benefits in a special degree, for its dominions are far-flung, the strategical area embraces the globe, whilst the enemy will usually operate on interior lines. For one thing, it secures an enormous economy in the use of ships. No longer will it be necessary for the commander to utilise the greater part of his cruiser strength in maintaining communications. For another, it renders nugatory all the plans of possible enemies to cut cables and seize landing-places in the hope of isolating detached units, and inducing uncertainty and confusion. Yet again, it strikes the death knell of the *guerre de course*. The great predatory cruiser, on its mission of destruction, will be followed day by day, hour by hour.

We can deduce, from experience on a small scale, the immense value of the system. During the Russo-Japanese war Admiral Togo was able to keep his main battle fleet in secure anchorage in its island harbour, whilst his cruisers flashed immediate intelligence of any movement by the Russian Fleet. The success of the naval measures against the gun-runners from the coast of Oman has been largely the fruit of the skilful employment of wireless telegraphy. At present the weakest links in the chain are in the East. We look for the immediate completion of the shore stations, and the raising of them to such a pitch that they will be capable of bridging all gaps like those between Bombay, Karachi, Colombo and Aden, and Aden and Singapore, without the necessity of relying on intervening ships. Then we want to see wireless on every British passenger ship, for all these will be invaluable scouts in war time. When these two ends are secured, Great Britain will have at last attained its ideal, an Imperial Fleet, one and indivisible

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# Portable Wireless Telegraphy.

## A New "Knapsack" Station.

IT is a truism to declare that wireless telegraphy will play an important part in the future of the art of war; the only question worth considering is to what extent it will be developed for Army purposes. The absence of rapid means of communication in the campaigns of the past was sorely felt. What the bearing on the South African campaign would have been if Ladysmith, Kimberley, and Mafeking possessed installations before they were besieged is a problem which may be left to military strategists to decide. It is safe to suggest that neither contemporary public opinion nor history would show any leniency towards those who, indifferent to the lessons of previous campaigns, entered upon future wars without equipment of this necessary adjunct to attack or defence. The only possible excuse that could be advanced for placing an army in the field without making provision for wireless communications would be the absence of reliable apparatus, or neglect to develop the application of wireless telegraphy to meet progressive military requirements. No such excuse can be sustained, however, for the Marconi portable stations as they stand are already well on the road to perfection; and as new conditions arise, and new developments in other branches of the Army take place, the Marconi system has been developed to meet these new conditions. For instance, it will have been noticed in the Press that successful equipments have recently been made by Marconi's Wireless Telegraph Company in

*Officers of the Westmorland and Cumberland Yeomanry Working Knapsack Station in Cumberland, 1912.*

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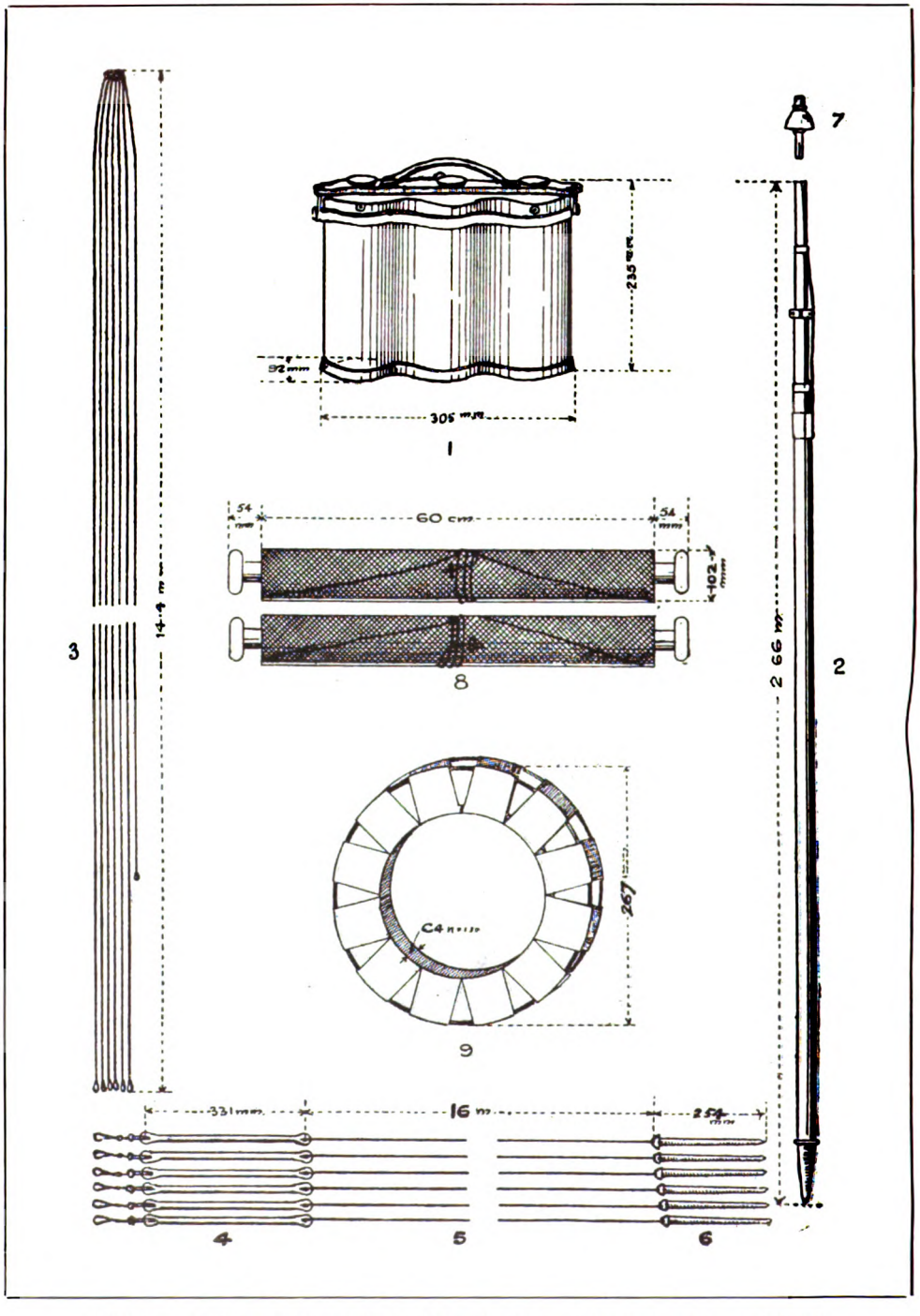


(1) Battery. (2) Telescopic Mast (30 feet). (3) Aerial. (4) Aerial Tension Insulators. (5) Aerial Stays. (6) Anchor Pegs. (7) Mast Insulator. (8) Earth Nets. (9) Aerial Drum.

*Aerial Gear, etc.*

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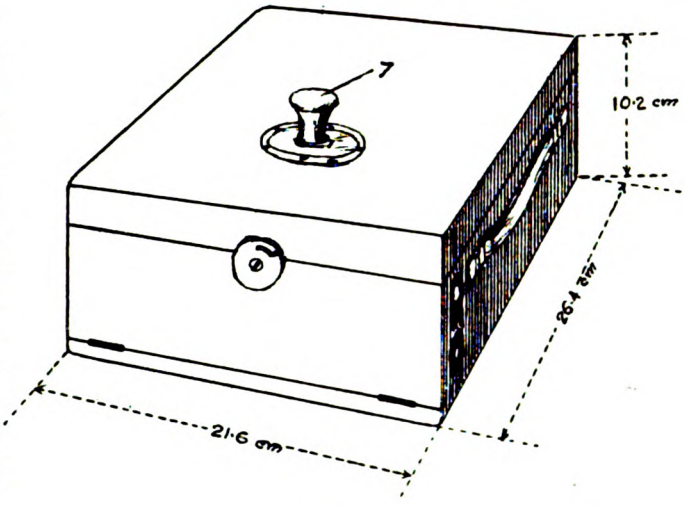
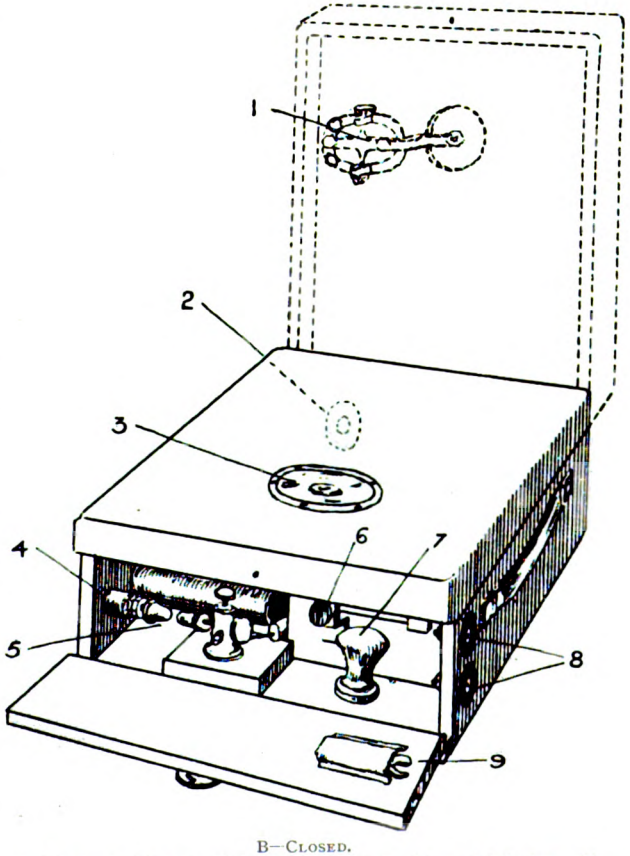
connection with wireless installations on aeroplanes. These experiments have already led to results from which it can safely be said that before very long there will be placed on the market a station capable of communicating from and to an aeroplane over a distance of anything from thirty to fifty miles. Such an installation would increase to a great extent the value of an aeroplane in time of war. Closely akin to this type of apparatus is another which is known as the "K" type knapsack station.

It is not so long since the knapsack station has been on the market, but it has been there long enough to demonstrate its usefulness. This is a type of apparatus which is well calculated to bring home to everybody the simplicity and ease of application of wireless telegraphy. Devoid of complications, extremely portable and easy to manipulate, the importance of the knapsack station cannot possibly be exaggerated. It is one of the short range stations manufactured by Marconi's Wireless Telegraph Company to meet the demand for an extremely light station intended for use by scouts, and to replace to a large extent visual signalling and mounted orderlies. There are many purposes for which this station can be used, including direction of gun fire. The knapsack station has a range of about ten miles, and is carried in knapsacks strapped to the backs of soldiers. Four men, each carrying a load of between 20 lb. and 30 lb., are necessary to carry a complete installation. Some idea of the portability of the knapsack station can be gathered from the accompanying illustration. The first man is seen carrying the mast and battery, the second man is carrying the earth nets, the transmitter and receiver are carried by the third man, while in the knapsack strapped to the back of the fourth man is the aerial gear. The mast is about 30 feet in height. It is of extremely light though rigid construction, made chiefly of aluminium tube, and is used to support an umbrella




A—Open.




B—Closed.

A—Open. B—Closed. (1) Manipulating Key. (2) Aerial Socket. (3) Leather Diaphragm. (4) Earth Socket. (5) Spark Electrodes. (6) Adjusting Screw of Coil. (7) Manipulating Key Handle. (8) Battery Terminals. (9) Adjusting Spanner.

*Transmitting Case for Knapsack Station.*

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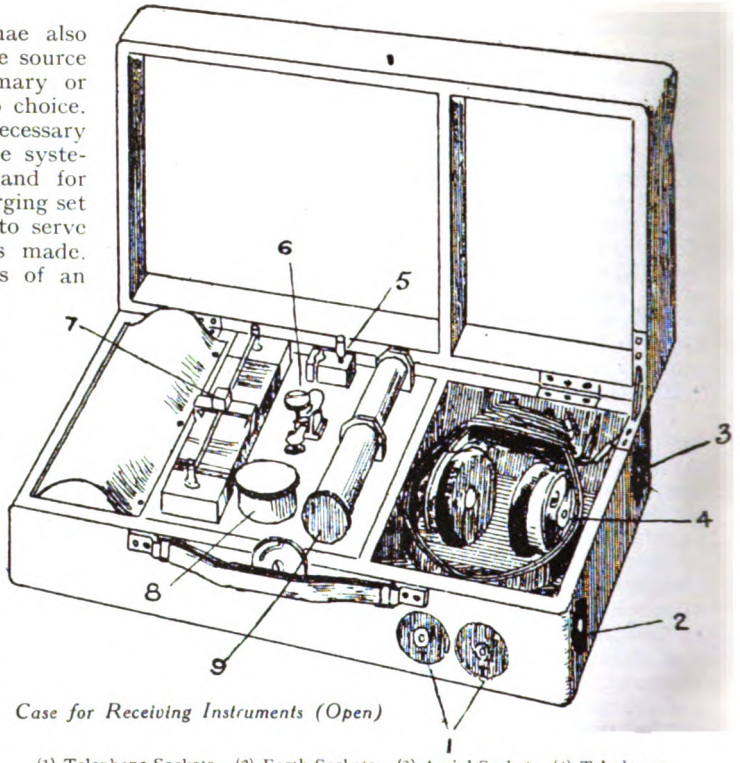
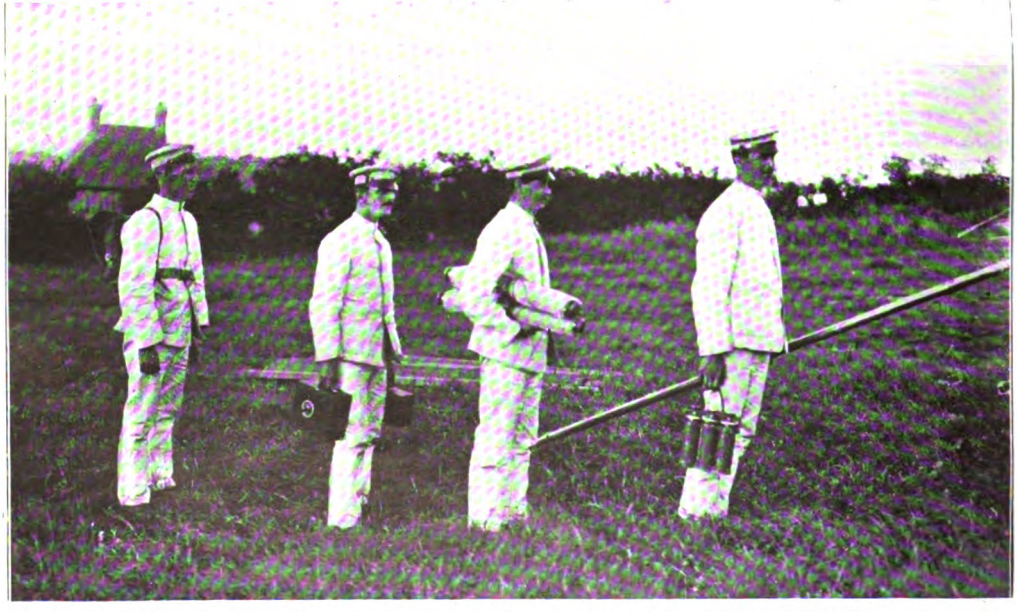
form of antennae, the antennae also acting as stays to the mast. The source of energy may be either a primary or a secondary battery according to choice. If the latter be employed, it is necessary that the accumulators should be systematically charged as required, and for this purpose a special field charging set which has a sufficient output to serve ten or twenty such stations is made. The transmitter, which consists of an ordinary ignition coil requiring a pressure of only six volts, is contained in a square wooden box weighing 11 lb. The receiver consists of the ordinary carborundum receiving circuit with jigger, tuning condenser, and four dry cells, which may be switched on and off as required. This is also contained in a box which weighs 6 lb. No elaborate system of syntonisation is provided, this being unnecessary owing to the short wave-length employed, which is so widely different to that in ordinary use as to make these stations practically immune from interference. A buzzer for testing the wave length is also part of the equipment.




*Case for Receiving Instruments (Open)*

(1) Telephone Sockets. (2) Earth Sockets. (3) Aerial Socket. (4) Telephones. (5) Plug Switch. (6) Crystal Holder. (7) Potentiometer. (8) Box of Spare Crystals. (9) Adjustable Tuning Condenser.



*A Knapsack Station. First Man carrying Mast and Battery ; Second, Earth Nets ; Third, Transmitter and Receiver : Fourth, Aerial Gear.*

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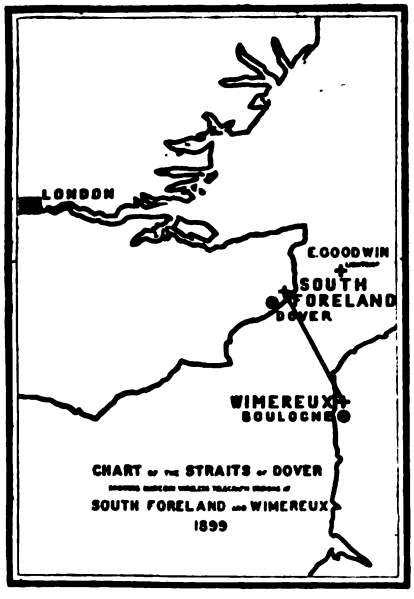
# Wireless on the Cross Channel Steamers

THE crossing of the Channel has always exercised a powerful fascination over enterprising minds. To go back to the early days of English history, the first well-authenticated item that we have is that Julius Cæsar crossed the Channel, thereby setting a fashion which has ever since had an ever-increasing band of followers. The second important fact in history that every child knows is that William the Conqueror crossed the Channel in 1066, and history seems continually to be occupied with that stretch of water which separates the British Isles from the remainder of Europe. It would seem as




though the narrow stretch of water was a stimulus to devise means of circumventing the difficulties of communication which its presence causes. With every means of communication, from submarine tunnels to aeroplanes, Dover and Calais seem to be the ordained beginning and end of enterprising attempts. Those who are familiar with " The Toilers of the Sea " will remember that the earliest steam vessel made its first voyages in the Channel, and it is within everyone's memory that the first aviation prize was for a flight across the Channel. Confirmation of this unwritten law of human enterprise may be found in the fact that wireless telegraphy was accepted as a real commercial possibility when messages had been transmitted over some thirty-three miles of water from Dover to Wimereux, near Boulogne. It is refreshing to recall some of the early trials which were undergone in the Channel and contrast them with the smooth and reliable working of wireless telegraphy on the Dover-Ostend, Dover-Calais, Folkestone-Boulogne and Southampton-Havre routes—to name only four of the steamship lines which span the English Channel.

When Mr. Marconi first commenced experimenting in England he had already demonstrated the possibility of transmission by means of radiant emanations, and was chiefly interested in the increase of the distance of transmission. It was a somewhat cumbrous operation to experiment with two land stations, and it seemed obvious that the best method of procedure was to have a land station on the coast, and a movable station on board of a vessel which could easily move to any suitable distance. With this object a station was erected at Alum Bay, on the north-west coast of the Isle of Wight, close to the Needles. By continual experiment and alteration the distance of the vessel from shore was increased until communication was established between Alum Bay and Bournemouth, a distance of fourteen miles. Shortly afterwards a station was erected at Poole, eighteen miles from Alum Bay, and satisfactory communication was established.

In December of the same year the Marconi Company obtained permission from the officials of Trinity House to demonstrate the practicability of communication between lightships and the shore, and a station was installed at the South Foreland lighthouse, and another on the East Goodwin lightship, twelve miles distant. This installation was extremely satisfactory, and worked for over two years, during which time many vessels and lives were saved by its use. It was proved in the Admiralty Court that property worth over £50,000 was saved by means of wireless in the case of one steamer which went ashore on the Goodwins. Twice during this period accidents occurred to the East Goodwin lightship—once when in a heavy gale part of the bulwarks were carried away, and once when a sailing vessel ran into it—and on both occasions aid was summoned by wireless, and arrived—as it could not otherwise have done—in time to be of great service.

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Experiments were next made to determine the influence of intervening land masses. Accordingly permission was obtained to instal a wireless set at Dover Town Hall, on the top

*Haven Station, Poole Harbour.*

of the tower of which is a flagstaff, forty-five feet high, giving a total height of one hundred and ten feet above sea level. Between this and the South Foreland is the Castle Cliff, over four hundred feet high, and therefore as effectual a barrier as could be desired. It was found, however, that messages were received with the utmost ease, and it was therefore concluded that no trouble need be feared from intervening mountains or from the curvature of the earth. During these trials a few stray dots and dashes were recorded on the Morse tape, and it was thought that these might be signals from an experimental station which had been erected at Wimereux, near Boulogne, thirty-three miles away. Accordingly the aerial was raised another thirty-six feet, giving a total height of one hundred and fifty feet above sea level. With this, satisfactory communication was established, and maintained, across Channel.

The following week the British Association held its annual gathering, and by a lucky chance the meeting was at Dover. Mr. Marconi was unable to be present, as he had arranged to leave for America to investigate the possibility of trans-Atlantic communication, and, *inter alia*, to report the America Cup races by wireless.

It was then nearly one hundred years since Volta had communicated to Sir Joseph Banks, then president of the Royal Society of London. in a letter dated March 20th, 1800, describing his electric-current generating apparatus, since known as the voltaic pile, or cell. The British Association were commemorating this discovery, as also were at the same time the French Association (Pour l'Avancement des Sciences) at Boulogne, and an Italian Electrical Congress at Como. Dr. Fleming delivered a lecture at Dover on "The Centenary of the Electric Current," the last half of which he devoted to the development of wireless telegraphy. Before him, as he lectured, were the transmitter and the receiver connected to the aerial at the Town Hall, and he there transmitted in the presence of the foremost scientists of the country, a message to M. Brouardel, president of the French Association (Pour l'Avancement des Sciences), a message conveying greetings and good wishes. This message was received at Wimereux and telephoned to M. Brouardel at Boulogne. Before the conclusion of the lecture a reply was received saying that M. Brouardel was "Very much touched by the proof of friendship which the wireless telegraph transmits to us," and sending congratulations and good wishes. The total time of transmission was thirty minutes, mainly taken up in getting from the Wimereux station to the nearest telephone. After the lecture a message was received from Como, which had been telegraphed from Como to Wimereux, and thence by wireless. In this way it was demonstrated to the foremost scientists of the world that wireless telegraphy was a practical success.

Since it had been proved that communi-

*Wimereux Station, near Boulogne, Spa.*

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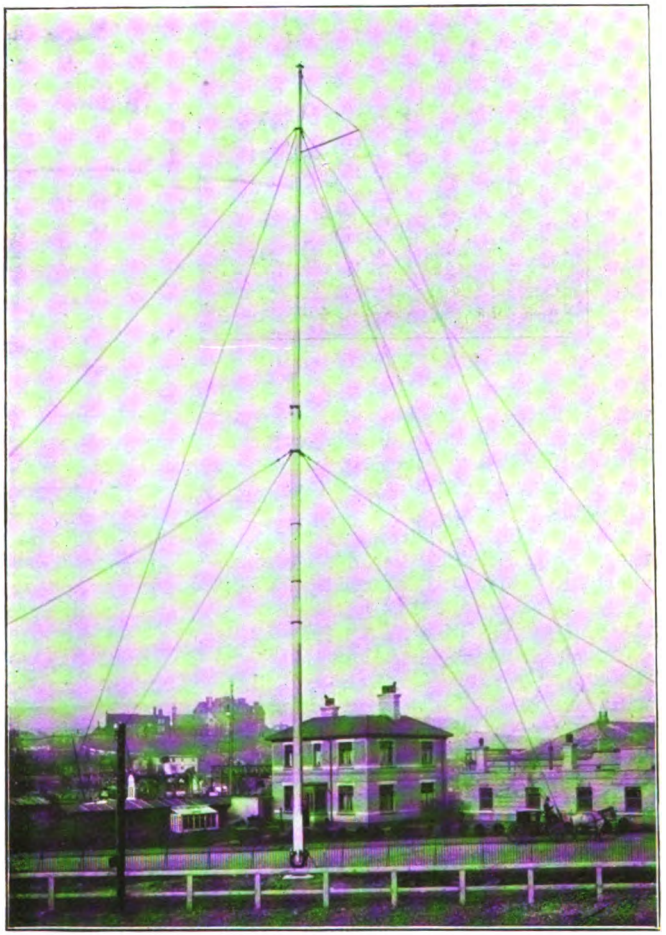
cation across Channel was possible, it was obvious that communication with any intermediate point was likewise possible, and one would have expected that almost at once the cross-Channel boats would have been fitted with an appliance of such manifest value. The whole of the boats would obviously have been always under complete control, and whether in fog or storm or calm they could instantly have been in touch with the shore in any emergency. Some years elapsed before these vessels were fitted. However, just as in course of time we passed from the ignorance of the dark ages to the comparative enlightenment of the present day, and just as the coracle of the ancient Briton has given place to the modern turbine steamer, so, with time, the obstacles in the path of progress disappeared. To-day, wireless telegraphy is regarded as indispensable for the comfort and safety of passengers, and for convenience of management of the boats.

The jaded worker in search of health and vigour can be recommended to make a trip on one of the numerous cross-Channel steamers with the assurance that he can keep in direct touch with land on both sides of him through the instrumentality of wireless telegraphy. At a trifling cost the pleasure seeker can administer an agreeable surprise to those left behind by sending a "marconigram." All that it is necessary for him to do is to hand to the purser on the vessel the text of the message, which is then sent pulsating through the ether and delivered to its destination through one of the stations on the south coast of England or the coast of France, Belgium or Holland.

There should be no difficulty in making one of these trips, which possess the double benefit of invigorating the body and stimulating the mind with memories of the victories gained by the intellect of man from the hidden mechanism of Nature. If the tourist desires to make an entry upon the Continent through one of the French ports, he is admirably catered for by three well-equipped lines of steamers; if Ostend is intended to be the point of embarquation he will be able to make the journey with equal speed, comfort and safety.

The London and South Western-Railway have on their Southampton-Havre route four vessels fitted with wireless telegraphy—the "Cæsaria," the "Sarnia," the "Hantonia" and the "Normannia"—this vessel and its sister ship, the "Hantonia," have only this summer been put in commission. They are both driven by geared turbines which maintain a speed of twenty knots, and which ensure a smoothness of running and an absence of that vibration so distressing in its effects upon those who desire to sleep in comfort. In each of these vessels there are five state cabins, placed amidships on the promenade deck, which are ordinary bedrooms afloat, being fitted with brass bedsteads and armchairs, and all the comforts one can desire. It may be mentioned that this line makes a speciality of the convenience of sleeping on the night crossing to



*Folkestone Station.*

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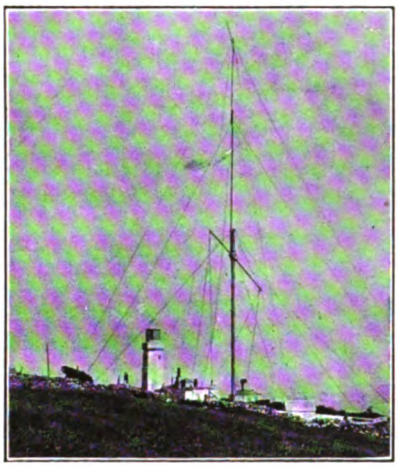
avoid waste of valuable time. All the latest life-saving appliances are to be found. The wireless operator's room is just aft of the boat deck, and the installation is a 1½-kilowatt ship



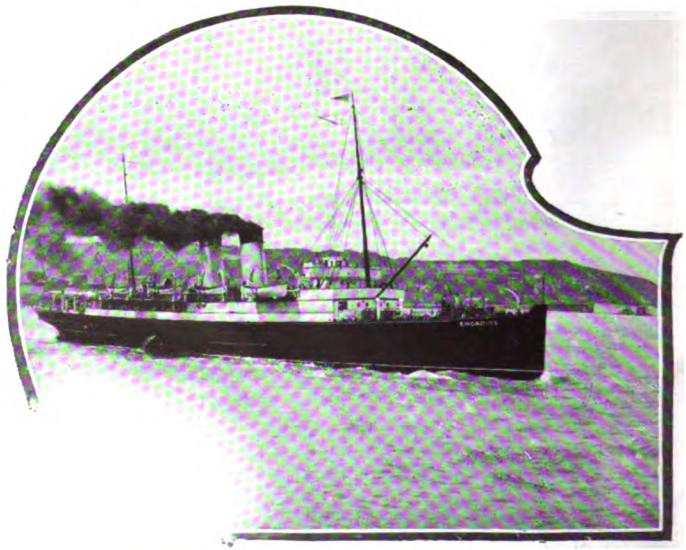
*Niton Station, Isle of Wight.*

set, with an emergency set. The vessel is, therefore, always capable of communicating with either shore; and, of course, on such vessels as these, a continual watch is kept throughout the voyage.

Another line which keeps abreast of the times is the Belgian Royal Mail Steam Packet, which has twelve vessels fitted by the Compagnie de Télégraphie sans Fil of Brussels with the Marconi system of wireless telegraphy and which communicates through the Newport stations with the Belgian coast.

In 1905 they put in service on the Dover-Ostend route the first turbine mail packet boat built on the Continent — the "Princess Elizabeth," which had a speed of twenty-four knots. In 1910, to celebrate the seventy-fifth anniversary of the opening of the first Belgian state railway, two further turbine vessels, the "Jan Breydel" and the "Pieter de Coninck," were built. These vessels have a length of 361 feet, a breadth of 40 feet, and a draught of 10 feet. We cannot describe in detail the luxury and comfort of these vessels, but a point deserving of mention is that the restaurant of the "Jan Breydel" is decorated by twelve magnificent panels painted by Henri Baes, each one reproducing a famous picture of the Flemish school—works of Van Eyck, Memling, Metsys, Porbus, Rubens, Van Dyck, Corneille de Vos, Snyders, Jordaens—with a portrait of the painter, reproduced from authentic sources, given in the top corner of each. The popularity of this line may be gathered from the fact that it carries nearly a quarter of a million passengers a year.

A company which has seen the advantages of wireless telegraphy from the very first is the South Eastern and Chatham Railway Company; and this company would have installed wireless sets many years ago had it not been for international restrictions. They had their first installation—on board the "Onward"—on November 12th, 1909, and in the next six months they installed four other sets. All their turbine boats are now fitted. Amongst other vessels which are fitted with wireless may be mentioned the "Queen," the "Invicta," the "Empress," and the "Victoria." This company possesses a private land station at Folkestone—which, it may be mentioned, was erected in the short space of two days—so that they are sure of being able at any moment to communicate with any one of their vessels without the delay which would arise if the message could not be sent direct. Of course, this only applies to administrative messages concerning the company's affairs; ordinary messages to passengers are sent via the Post Office station at North Foreland. The boats are all fitted with accumulator 10-inch coil sets, which are easily moved, and are frequently shifted from one vessel to another.



*SS. Engadine (South Eastern and Chatham Railway.)*

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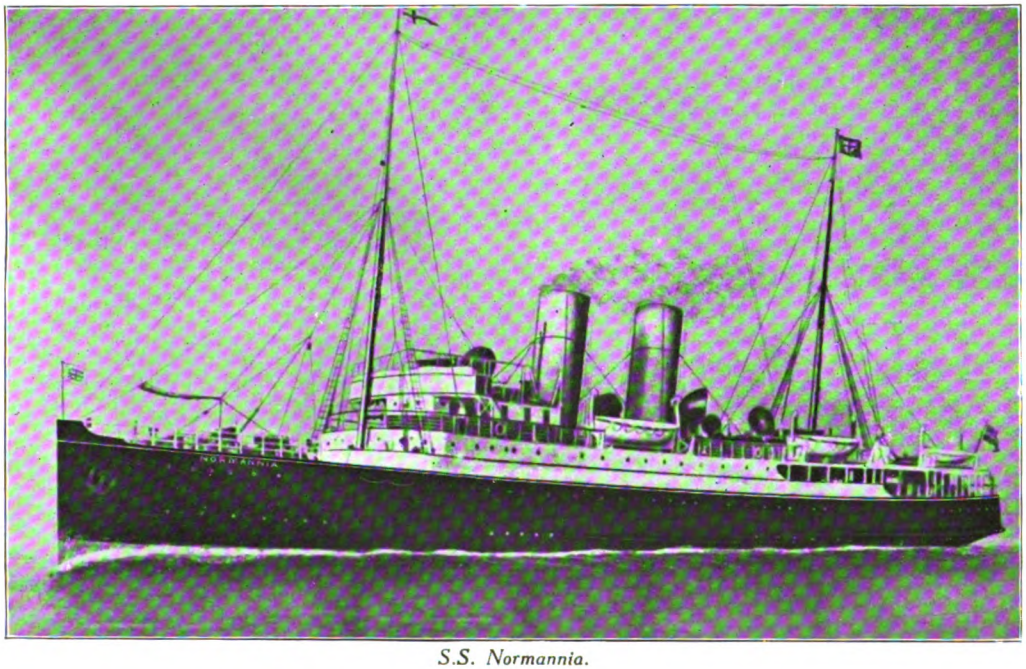
It might be said that with such vessels wireless telegraphy is of greater use in life-saving than lifeboats themselves. It is very rare that one of these vessels could not be reached within an hour, and with modern devices such as watertight bulkheads, these vessels could easily remain afloat for that time in the worst weather after the most severe accident that is likely to occur. In bad weather the task of taking to the boats would be one of considerable risk, and to reach the shore would need hours of the hardest toil. Aid summoned by wireless could arrive quickly, all the passengers could be removed with little risk and brought to shore with ease and safety. Such accidents as would necessitate the abandonment of a vessel in the Channel are very rare, but they are not impossible, and it is satisfactory to know that the danger to human life is reduced to a negligible quantity.



*S.S. Normannia.*

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THE Austrian Ministry of Commerce have published a decree concerning the establishment of a wireless telegraph office of control in Trieste. This is a sub-department of the Ministry of Commerce, and is concerned with the control of ships' operators on Austrian vessels. It further exercises State control over private ship stations on Austrian vessels, and on foreign ships in Austrian waters. The decree came into effect on April 1st of this year. Application for a ship telegraph office on board an Austrian vessel must be made to the Ministry of Commerce. The equipment of the office and accessories is provided for and maintained by the State, who also supply one or two telegraphists, but the shipowner must furnish the material for the establishment and working of a wireless telegraph office on board, and the accommodation of the office staff. The shipowner pays to the State for the ship telegraph office an annual sum in the case of ships which come under the regulations of the Ministry of Commerce dated November 10th, 1910, which amounts to Kr. 2,500 or Kr. 2,200, according to whether the type of apparatus used is first or second class. Ship stations transmit free of coast tax general service telegrams relating to navigation, or telegrams which are addressed by the captain of the ship to the shipowner or to his representative or agent. Collection of coast and land taxes for service telegrams is effected on the basis of the receipts kept by the wireless station.

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H.M.S. "Leda," which has been appointed to the Moray Firth Control, is the first fishery service cruiser fitted with wireless telegraphy to arrive in the port of Aberdeen.

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T. J. O'Donnell, from the "Dominion" to the "Devonian."

S. A. Leith, from the "Vauban" to the "Dominion."

A. E. Jones, from the School to the "Dominion."

G. Kemp, from the "Potomac" to the "Galicia."

C. H. Whitaker, from the "Ambrose" to the "Vauban."

W. P. Greaves, from the "Winifredian" to the "Hypatia."

A. Cottingham, from the "Cymric" to the "Mauretania."

E. Wilkinson, from the School to the "Merion."

A. J. Osborn, from the "Denis" to the "Tunisian."

G. M. Burgham, from the School to the "Tunisian."

A. G. Dicks, from the "Caronia" to the "Virginian."

A. Bolster, from the "Dominion" to the "Scandinavian."

C. H. Bartlett, from the "Volturno" to the "Pardo."

N. A. Boon, from the "Lake Erie" to the "Pardo."

H. S. Bride, from the "Titanic" to the "Medina."

H. M. Palmer, from the "Balmoral Castle" to the "Lake Erie."

E. C. Rumford, from the "Montfort" to the "Mount Royal."

A. J. Thompson, from the "Stephano" to the "Majestic."

A. E. Bright, from the "Oceanic" to the "Majestic."

W. Yelland, from the School to the "Inkosi."

H. Roffey, from the "Corinthian" to the "Turakina."

H. Anderson, from the "Marathon" to the "Orania."

C. A. Hill, from the "Orania" to the "Demosthenes."

R. E. Greatbatch, from the "Arabia" to the "Persia."

G. Balding, from the "Minneapolis" to the "Galway Castle."

W. Merryweather, from the "Sicilian" to the "Corinthian."

A. Schofield, from the "Sicilian" to the "Corinthian."

P. F. Rice, from the "Minnetonka" to the "Montfort."

F. V. Kinder, from the "Gothic" to the "Beltana."

J. E. Marriott, from the School to the "Oceanic."

A. G. Dunn, from the School to the "Gothic."

A. C. Baker, from the "Corinthic" to the "Mantua."

A. Beattie, from the School to the "Araguaya."

THE MARCONIGRAPH

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# Wireless Legislation in the United States

IN view of the decision of the International Radio-telegraphic Conference to recommend to the nations represented that the introduction of legislation by which wireless telegraphy on ocean vessels should be made compulsory, it is interesting to note that much progress has already been made in this direction in the United States. The Act, which came into force on July 1st, 1911, prohibited the use of United States ports by ocean-going vessels carrying fifty or more persons, including passengers and crew, unless such ships were fitted with efficient wireless apparatus and carried a qualified operator. The Act does not apply to steamers plying between ports less than 200 miles apart. On July 23rd, 1912, an amended Act was passed in accordance with which ships navigating the Great Lakes are now included, while more definite regulations are laid down regarding plant and operators.

The 1912 Act (containing only two sections) does not alter the minimum number of persons which a ship must carry to bring it within the scope of the law, and the requirement that apparatus should be capable of transmitting and receiving messages over a distance of at least one hundred miles, day and night, remains. An important addition, however, is the provision which requires that—

> *An auxiliary power supply, independent of the vessel's main electric power plant, must be provided which will enable the sending set for at least four hours to send messages over a distance of at least one hundred miles, day or night, and efficient communication between the operator in the radio-room and the bridge shall be maintained at all times.*

The foregoing extract from the new Act is, in effect, an endorsement of the practice of the Marconi Company, who, for many years past, have supplied with each ship installation an independent emergency plant which obtains its supply of power from a storage battery and coil.

The United States Legislature have been concerned with the maintenance of a constant watch on vessels, and the following clause in the new Act gives effect to this:

> *The radio-equipment must be in the charge of two or more skilled operators, one or the other of whom must be on duty at all times while the vessel's journey is being navigated. The master of every vessel belonging to the United States shall have complete control of all equipment, operators, regulation of their watches, and the transmission and receipt of messages, in so far as these matters have not been regulated by law or by international agreement. Wilful failure on the part of a ship's master to observe the conditions laid down in this paragraph with regard to equipment, etc., during the ship's voyage shall subject him to a penalty of 100 dollars.*

The above provisions do not apply to steamers plying between ports or places less than two hundred miles apart. The Act comes into force with regard to the Great Lakes traffic on April 1st, 1913, and for ocean cargo steamers it takes effect on July 1st, 1913.

Provision is made for cargo steamers that a member of the ship's crew, duly certified and entered in the ship's log as competent to receive distress calls and other danger signals, and further able to maintain a watch sufficient to safeguard the lives of those on board, may be accepted *instead of the second operator* provided by the Act.

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The Alexander Wireless Telegraph Bill, which has been under consideration by the House of Representatives in the United States, was recently struck out of the calendar, and it is understood that there is little probability that it will pass during the present session of Congress. Representative Mann objected to a consideration of the subject at this time on the ground that it requires more study and further consideration before taking final action. The Government is said to be anxious to secure a broad law which will secure relief from interference with wireless communication by the numerous amateurs.

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S. A. Leith, from the "Vauban" to the "Dominion."

A. E. Jones, from the School to the "Dominion."

G. Kemp, from the "Potomac" to the "Galicia."

C. H. Whitaker, from the "Ambrose" to the "Vauban."

W. P. Greaves, from the "Winifredian" to the "Hypatia."

A. Cottingham, from the "Cymric" to the "Mauretania."

E. Wilkinson, from the School to the "Merion."

A. J. Osborn, from the "Denis" to the "Tunisian."

G. M. Burgham, from the School to the "Tunisian."

A. G. Dicks, from the "Caronia" to the "Virginian."

A. Bolster, from the "Dominion" to the "Scandinavian."

C. H. Bartlett, from the "Volturno" to the "Pardo."

N. A. Boon, from the "Lake Erie" to the "Pardo."

H. S. Bride, from the "Titanic" to the "Medina."

H. M. Palmer, from the "Balmoral Castle" to the "Lake Erie."

E. C. Rumford, from the "Montfort" to the "Mount Royal."

A. J. Thompson, from the "Stephano" to the "Majestic."

A. E. Bright, from the "Oceanic" to the "Majestic."

W. Yelland, from the School to the "Inkosi."

H. Roffey, from the "Corinthian" to the "Turakina."

H. Anderson, from the "Marathon" to the "Orania."

C. A. Hill, from the "Orania" to the "Demosthenes."

R. E. Greatbatch, from the "Arabia" to the "Persia."

G. Balding, from the "Minneapolis" to the "Galway Castle."

W. Merryweather, from the "Sicilian" to the "Corinthian."

A. Schofield, from the "Sicilian" to the "Corinthian."

P. F. Rice, from the "Minnetonka" to the "Montfort."

F. V. Kinder, from the "Gothic" to the "Beltana."

J. E. Marriott, from the School to the "Oceanic."

A. G. Dunn, from the School to the "Gothic."

A. C. Baker, from the "Corinthic" to the "Mantua."

A. Beattie, from the School to the "Araguaya."

THE MARCONIGRAPH

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# Wireless Legislation in the United States

IN view of the decision of the International Radio-telegraphic Conference to recommend to the nations represented that the introduction of legislation by which wireless telegraphy on ocean vessels should be made compulsory, it is interesting to note that much progress has already been made in this direction in the United States. The Act, which came into force on July 1st, 1911, prohibited the use of United States ports by ocean-going vessels carrying fifty or more persons, including passengers and crew, unless such ships were fitted with efficient wireless apparatus and carried a qualified operator. The Act does not apply to steamers plying between ports less than 200 miles apart. On July 23rd, 1912, an amended Act was passed in accordance with which ships navigating the Great Lakes are now included, while more definite regulations are laid down regarding plant and operators.

The 1912 Act (containing only two sections) does not alter the minimum number of persons which a ship must carry to bring it within the scope of the law, and the requirement that apparatus should be capable of transmitting and receiving messages over a distance of at least one hundred miles, day and night, remains. An important addition, however, is the provision which requires that—

> *An auxiliary power supply, independent of the vessel's main electric power plant, must be provided which will enable the sending set for at least four hours to send messages over a distance of at least one hundred miles, day or night, and efficient communication between the operator in the radio-room and the bridge shall be maintained at all times.*

The foregoing extract from the new Act is, in effect, an endorsement of the practice of the Marconi Company, who, for many years past, have supplied with each ship installation an independent emergency plant which obtains its supply of power from a storage battery and coil.

The United States Legislature have been concerned with the maintenance of a constant watch on vessels, and the following clause in the new Act gives effect to this:

> *The radio-equipment must be in the charge of two or more skilled operators, one or the other of whom must be on duty at all times while the vessel's journey is being navigated. The master of every vessel belonging to the United States shall have complete control of all equipment, operators, regulation of their watches, and the transmission and receipt of messages, in so far as these matters have not been regulated by law or by international agreement. Wilful failure on the part of a ship's master to observe the conditions laid down in this paragraph with regard to equipment, etc., during the ship's voyage shall subject him to a penalty of 100 dollars.*

The above provisions do not apply to steamers plying between ports or places less than two hundred miles apart. The Act comes into force with regard to the Great Lakes traffic on April 1st, 1913, and for ocean cargo steamers it takes effect on July 1st, 1913.

Provision is made for cargo steamers that a member of the ship's crew, duly certified and entered in the ship's log as competent to receive distress calls and other danger signals, and further able to maintain a watch sufficient to safeguard the lives of those on board, may be accepted *instead of the second operator* provided by the Act.

---

The Alexander Wireless Telegraph Bill, which has been under consideration by the House of Representatives in the United States, was recently struck out of the calendar, and it is understood that there is little probability that it will pass during the present session of Congress. Representative Mann objected to a consideration of the subject at this time on the ground that it requires more study and further consideration before taking final action. The Government is said to be anxious to secure a broad law which will secure relief from interference with wireless communication by the numerous amateurs.

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CAPTAIN M. H. P. RIALL SANKEY.

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# Captain M. H. P. Riall Sankey,

**R.E. (Ret.), M.Inst.C.E., M.I.Mech.E.**

**Director of Marconi's Wireless Telegraph Co., Ltd.**

IT is only necessary to glance at the bare record of work accomplished by Captain Sankey to realise that it is strenuous endeavour, linked with a readiness to "seize fortune by the hair," that brings a man into the foremost rank of his profession.

Captain Sankey was born at Nenagh, in Ireland, in 1853, and was educated in Switzerland, and afterwards passed, with flying colours, through the Royal Military Academy at Woolwich and the School of Military Engineering at Chatham. While under training at Chatham he took part, in 1875, as a young officer of the Royal Engineers, in important experiments carried out by the Royal Commission on Railway Accidents with regard to continuous railway brakes. In 1876 he entered the "Barracks Branch" of the War Office, and was engaged in architectural design, but shortly afterwards passed on to take charge of the Royal Engineers Drawing Office at Manchester. In 1878 he was ordered to Gibraltar, where he assumed the management of the Military Telegraphs and Signal Station at the fortress, but the next year was appointed Instructor in Fortification, Geometrical Drawing, and Descriptive Geometry at the Military College, Kingston, in Canada. Not content with the strenuous work entailed by this position, he initiated courses of instruction in fortification, etc., which considerably raised the standard of efficiency among the students.

He was recalled in 1882 to join the Ordnance Survey at Southampton, and there he was placed in charge of the workshops, machinery, stores, and electrotyping. Under his direction considerable changes took place in the system of lithographic and copperplate printing. He was the first to apply dynamos to the process of copperplate reproduction for map printing, and the value of the new system was readily recognised; while a paper which he delivered before the Institute of Electrical Engineers on the "Electrolytic Deposition of Copper" was awarded the Fahie Premium, and another, entitled "A Problem Relating to the Economical Deposition of Copper," gained the Paris Premium.

In 1889 Captain Sankey retired from the Service, and became one of the directors of Messrs. Willans & Robinson, Ltd. On the death of Mr. Willans he edited his friend's posthumous works on "Steam-Engine Trials." Later he took an important part in designing the Victoria Works, Rugby, admitted to be amongst the best arranged in the world, and he was designer of the steam turbines which were afterwards manufactured by the firm.

In 1904 Captain Sankey severed his connection with Messrs. Willans & Robinson to take up work as a consulting engineer, and for two and a half years has been one of the directors of Marconi's Wireless Telegraph Co., Ltd.

Captain Sankey is a member of the Institution of Civil Engineers, the Institution of American Engineers, the Institution of Electrical Engineers, Member of Council of the Institution of Mechanical Engineers, and Associate of the Institution of Naval Architects, while it is not long since that he retired from a five years' membership on the governing board of the National Physical Laboratory. He has served upon the committees on steam-engine research and gas-engine research, and many others organised by the Institution of Civil Engineers, as well as on the Engineering Standardisation Committees on prime movers, generators, motors, and glow-lamps, and twice he has been appointed by the Institution of Civil Engineers to committees on questions of steam-engine economy, the first time as secretary and the second as chairman.

Captain Sankey translated from the German Prof. Ritter's book on "Bridges and Roofs," and his expert thermodynamic knowledge found expression in a book on "The Energy Chart and its Practical Application to Reciprocal Steam-Engines." Part IV. of Rimmington's "Building Construction," although published anonymously, was also from his pen. Among the papers which Captain Sankey has read before technical societies are one on the "Thermal Efficiency of Steam-Engines," awarded the Telford Gold Medal and Premium; one read before the Institution of Civil Engineers, which gained the Telford Gold Medal and Premium; and a third, on the "Governing of Steam-Engines," read before the Institute of Mechanical Engineers, which gained the Willans Premium. At the Royal Society of Arts Captain Sankey was this year chosen to deliver the Howard Lectures, and read a series of papers on "Heavy Oil Engines."

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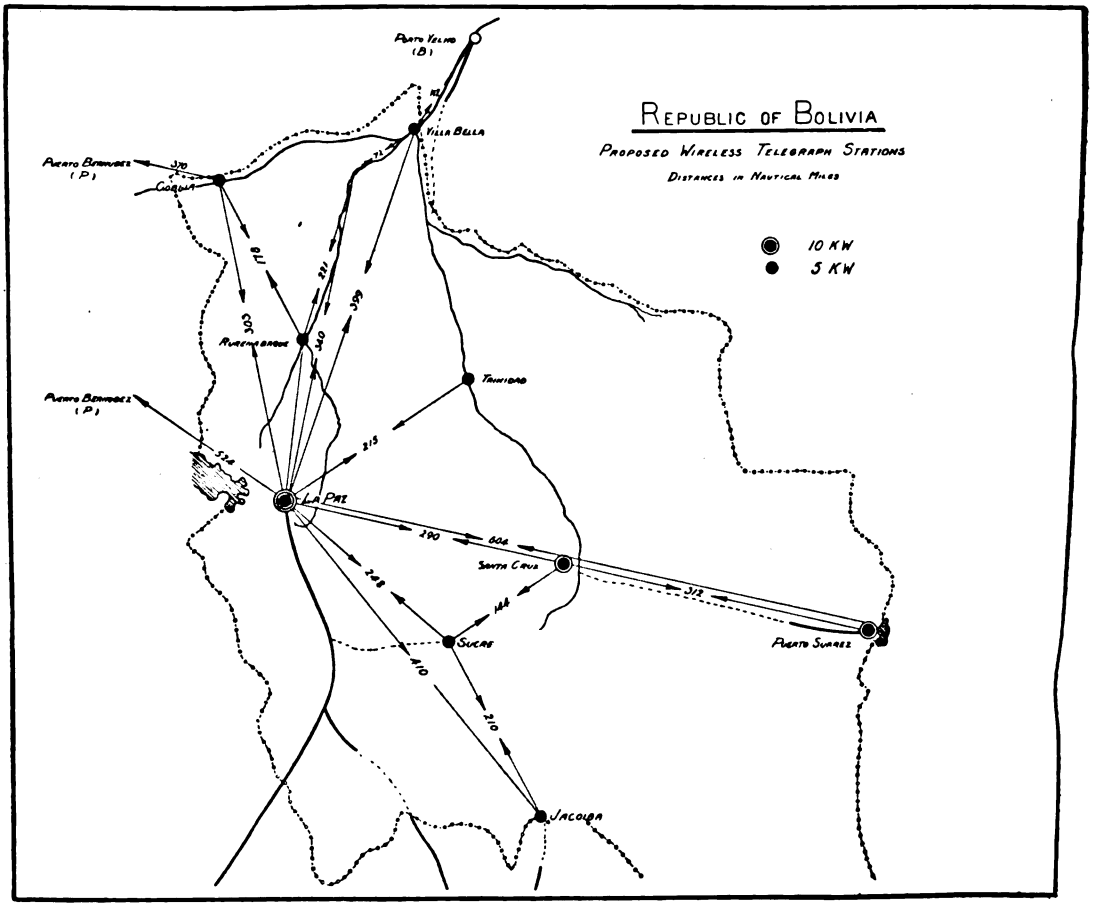
# Linking the South American Republics

## Wireless System for Bolivia

FEW countries have risen to great commercial importance with such rapidity as the republics grouped in South and Central America. Within comparatively recent years they were known to the outer world mainly, if not entirely, through their struggles for independence. But with the gradual settlement of internal conditions they began to compel attention, and soon they became vast outlets for the surplus capital and enterprise of Europe and North America. Developments proceeded apace; industries were established and prospered; populations increased, and the need for internal and external communications became more and more pressing. Obviously there were here admirable conditions for demonstrating the immense advantages of wireless telegraphy over the cumbrous network of wood and wire at the mercy of storm and destruction by accident or by human agency. Wireless telegraphy has already penetrated to the Upper Amazon, and at the present time is playing a great part in opening up a vast region of the outer world. Chile has contracted for the erection of Marconi stations, with a view to ensuring regular communication at all times

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during the day and night, and other countries in South America have provided themselves with this means of communication. It is one of the chief features of wireless, and one which plays no unimportant part towards contributing to its great success, that, owing to its simplicity, it can be installed in regions which present the greatest difficulties to the overhead and underground telegraphic cable systems, difficulties which have very often proved to be insuperable, with the result that not a few remote parts of the world have been compelled to forego the use of telegraphy—to do without that greatest aid to modern life. But wireless telegraphy is altering all this. Day by day new districts are being brought within its scope; before long there will be few large stretches of territory in the world that will not be linked up by means of wireless telegraphy—few stretches, at any rate, where the application of the system is warranted by commerce and population, or the potentialities for such.

Bolivia is the latest of the South American Republics to adopt wireless telegraphy, the Government having recently entered into a contract with Marconi's Wireless Telegraph Co. for the establishment of a great and important scheme. The country is the third largest political division of the continent in which it is situated, and is bounded north and east by Brazil, south by Paraguay and Argentina, and west by Chile and Peru. It is named after the great liberator, Simon Bolivar, who spent nine-tenths of a splendid patrimony in its service; and although he had for a considerable period unlimited control over the revenues of three countries—Colombia, Peru, and Bolivia—he died in 1830 without a shilling of public money in his possession. Bolivar achieved the independence of three States, and called forth a new spirit in the southern portion of the New World.

The physical and climatic conditions of the country are worth bearing in mind by those who do not yet realise the endless variation of territory over which wireless communication can be successfully maintained. The popular conception of Bolivia is that of an extremely mountainous country, although fully three-fifths of it is composed of low alluvial plains, great swamps and flooded bottomlands, and gently undulating forest regions. The country has no seacoast, and it lies wholly within the torrid zone, variations in temperature being due to elevation, mountain barriers, and prevailing winds. Bolivia possesses every gradation of temperature from that of the tropical lowlands to the Arctic cold of the snow-capped peaks directly above. In the lowlands and mountain valleys up to an elevation of 5,000 ft. the temperature is tropical, winter is unknown, and the atmosphere is exceedingly humid. The *valle* zone, which includes the deep valleys from 5,000 ft. to 9,500 ft., has a warm climate, with moderate variations, and is sometimes described as " the region of perpetual summer." At the other extreme we have " the region of eternal snow "—an Arctic zone within the tropics!

The contract of the Marconi Company with the Bolivian Government provides for the erection of two groups of stations—viz., five 5-k.w. stations, and two 10-k.w. stations. The latter will be erected at La Paz and Puerto Saurez. The 5-k.w. stations will be at Riberalta or Villa Bella, Cobija, Trinidad, Yacuiba and Santa Cruz. On the accompanying illustration the station at Santa Cruz is shown in error as a 10-k.w.

The progress of the work in connection with this scheme will be watched with interest, for the stations may ultimately become linked in a considerably larger network than is at present apparent. Bolivia, Chile, and Argentina—at least three countries—will be in possession of important wireless organisations, perfecting their internal telegraphic arrangements and linking together the three republics. This connecting up of adjoining countries, important as it undoubtedly is, must be surpassed by the scheme for linking up the two portions of the great Western Hemisphere—North and South America.

## High Power Station for South Africa

THE South African Government have notified the Imperial Government of its readiness to participate in the scheme of Empire wireless stations for purposes of Imperial defence as well as for commercial purposes. The Union Government has selected a site at Pretoria where a high-power station, similar to those to be installed in other parts of the Empire, will be built.

General Botha, through Sir David Graaff, has notified the Secretary of State for the Colonies and the Postmaster-General of the intention of his Government to defray the cost of the installation, the total of which is estimated at £80,000. From the point of view of defence the Union Government regards the scheme as highly important, for from the Pretoria station, the administrative capital, the Union will, by means of its high-powered duplex station, receiving and transmitting at the same time and fitted with automatic apparatus, be in day and night communication with England on the one hand and Australia on the other.

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# The Wireless Compass

THE great development in both size and speed of modern ships enormously increases the responsibilities of those who command and navigate them, and has necessitated a careful examination of the existing methods for determining a ship's position at all times by day and night, and in all conditions of weather, both when in sight of land and on the open ocean. The discovery of the mariner's compass towards the close of what historians of to-day are accustomed to call the Middle Ages was not merely of importance to navigation, but its conjunction with the inventions of gunpowder, paper, and the printing press, and the Copernican demonstration that the sun and not the earth is the centre of our planetary system, was destined at the time to change the entire aspect of European civilisation. Great as is the value of the mariner's compass, its improvement has been but a slow process. From a poem written in the first half of the fifteenth century it would seem that the compasses used at that time by English mariners were of a very primitive description. Barlowe, in 1616, complains that "the Compasse needle, being the most admirable and usefull instrument of the whole world, is both amongst ours and other nations for the most part so bungerly and absurdly contrived, as nothing more." About one hundred and forty years later Dr. Gowan Knight showed that the Chinese method of suspending the needle was more conducive to sensibility than the one in vogue at the time. In 1820 Peter Barlow reported to the Admiralty that half the compasses in the British Navy were mere lumber, and ought to be destroyed, and a form which he introduced remained the standard Admiralty type until the introduction of the modern Kelvin compass.

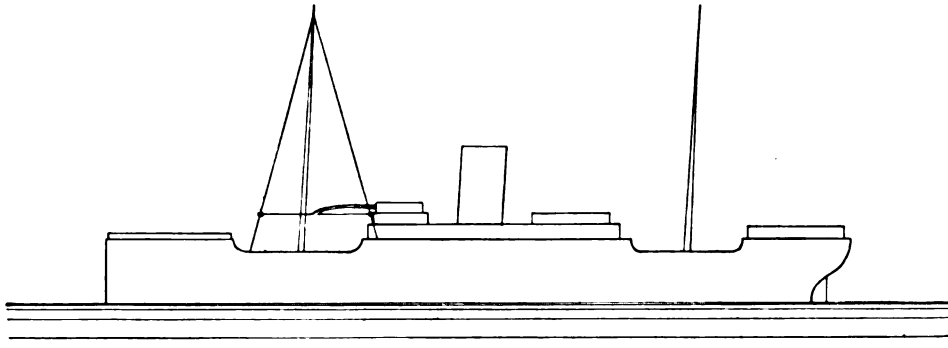

*Fig. 1.*

It has been left to the present day, however, to devise an apparatus that will aid navigation in foggy weather, and to furnish ships with an undreamt of guide across the waters of the earth.

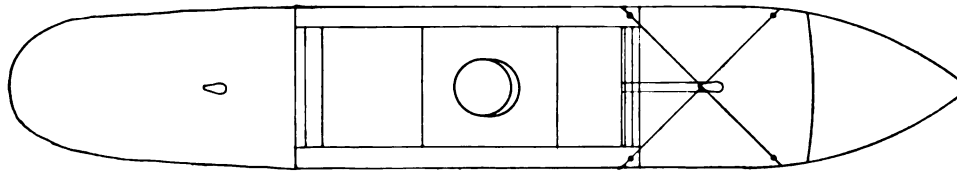

*Fig. 2.*

Such an apparatus is the Wireless Compass, which has been developed at the Marconi works. Hitherto it has been necessary, in order to minimise the dangers of collisions or groundings, to reduce the speed of vessels in foggy weather, but this entails considerable loss of valuable time;

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and even when the precaution has been taken accidents are not infrequent. The compass to which we now refer, and which is worked by ether waves, such as are employed in wireless

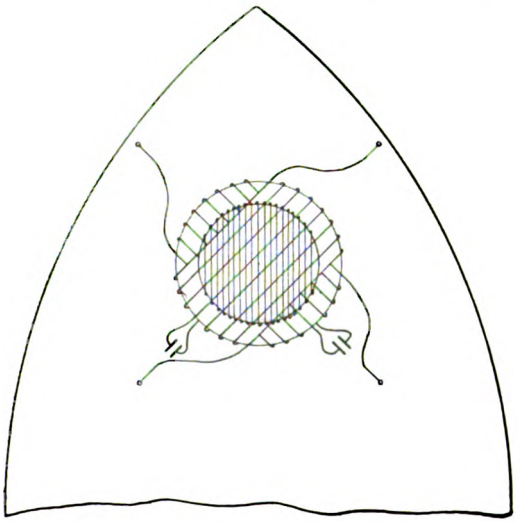

*Fig. 3.*

telegraphy, is quite independent of weather conditions. The two main aids which it affords to navigation are :

(1) The position of the ship with regard to any coast station can be determined.

(2) The direction of an approaching or overtaking ship can be found.

Mariners will agree that these are two very considerable advantages.

The Wireless Compass is formed of three main parts—the receiving aerials, the radiogoniometer, and the detector. The receiving aerials (Figs. 1 and 2) consist of two equal triangles, each formed by a single wire, placed so that their planes are exactly at right angles. The apices are held in position by a single porcelain insulator of special type which may be attached to a mast or stay between masts, the sloping sides and bases being stayed to stanchions or convenient ship fittings with ebonite rod insulators. The bases are cut in the centre and insulators inserted ; the four ends thus formed are led to the goniometer. The copper wires used are less than $\frac{1}{5}$ in. in diameter, and besides being extremely light, are almost invisible.

The radiogoniometer (Fig. 3) consists of two equally wound coils fixed vertically and at right angles. In the space enclosed by these coils is fitted a single movable coil working on a vertical axis, and this coil is known as the "exploring coil." A circular scale calibrated from 0° (ahead) to 180° (astern) shows the position of the exploring coil. The two fixed coils are cut in their centres, and adjustable condensers are inserted ; these condensers are used for tuning the aerials to the required wavelengths, and are mechanically connected so that both aerials are adjusted simultaneously. Small protective spark gaps are also fitted.

The detector, which is connected to the exploring coil of the radiogoniometer by flexible leads, is arranged for use with either valve or crystal rectifiers. The necessary tuning condensers are included, and a variable coupling for increasing or decreasing the strength of the received signals is provided. The signals are received on a telephone. An accumulator is also provided which contains sufficient current to last for a very considerable time ; when exhausted the accumulator can be easily recharged.

The Wireless Compass does not give magnetic bearings ; it is azimuthal, and positions are given with regard to the ship's axis ; the position of the axis is, of course, known from the magnetic compass. The compass does not give one absolute direction for the position of a station, but it gives two possible directions, one exactly opposite to the other. Thus a

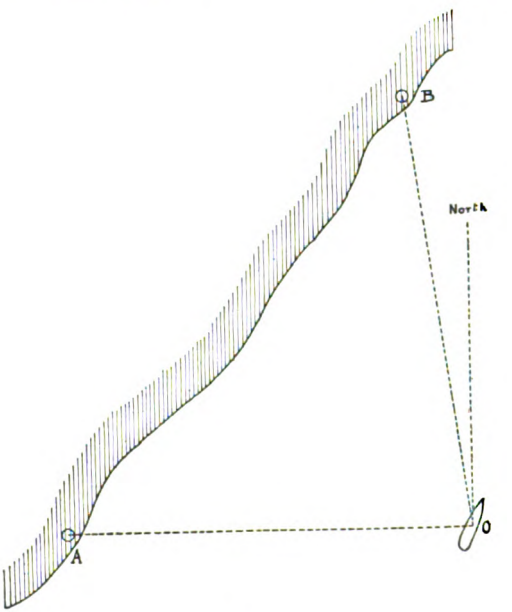


*Fig. 4.*

station shown on the port bow may be on the starboard quarter at exactly 180° from the port position. The port or starboard position of a land station is generally known, and in any

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case can be accurately determined by two successive readings. The range of the compass varies with the strength of the sending station and size of aerials fitted; when used with a standard ship set it is from 25 to 60 miles.

The principle of the compass may be briefly explained thus: Each triangular loop of wire is a directive aerial, and receives best when its plane is in the direction of the sending station; if swung so as to be at right angles to the transmitter, it receives nothing.

The intensity of the received current varies with the cosine of the angle which the plane of the aerial forms with the transmitting station. Except in the case where the plane of one aerial is directly at right angles to the transmitting station, two currents, whose intensities depend upon the direction of the sender, will be generated in the aerials. These currents are carried through the fixed coils in the radio-goniometer, and generate in the enclosed cylindrical space two magnetic fields at right angles, which compose themselves in a resultant field in a position at right angles to the direction of the sending station, assuming the planes of the coils coincide with the planes of their respective aerials. The exploring coil will therefore be traversed by the maximum current when its axis coincides with the resultant field, and will be quite inoperative when at right angles to that field. The direction which gives maximum strength of signals is the direction of the sending station.

The compass is designed to work with ships' standard wave-lengths, and can be tuned continuously to all wave-lengths between 250 and 700 metres. Special instructions given with each instrument explain in detail how to tune the various circuits. To find the position of maximum strength with great accuracy, the pointer should be turned to either side of the maximum until signals become inaudible—the mean of the two points obtained is the exact maximum, and therefore the required position. In this way the direction of the transmitting station can be found to within 1 or 2 degrees.

Two coast stations, A and B (Fig. 4), being within range, the following method quickly gives the desired position of the ship, O: the direction of the stations having been found and read as angles to the ship's axis, a line representing the course is drawn on the chart, and with this line the two read angles are drawn so as to pass through the land stations, A and B; the intersection of the lines gives the ship's position.

If *one station* only is available, it is necessary to take two readings at an interval of time, as follows:

The direction, O A (Fig. 5), is found as an angle with the ship's course; the ship then proceeds for, say, half an hour at a known speed in the direction O $O_1$. A second reading

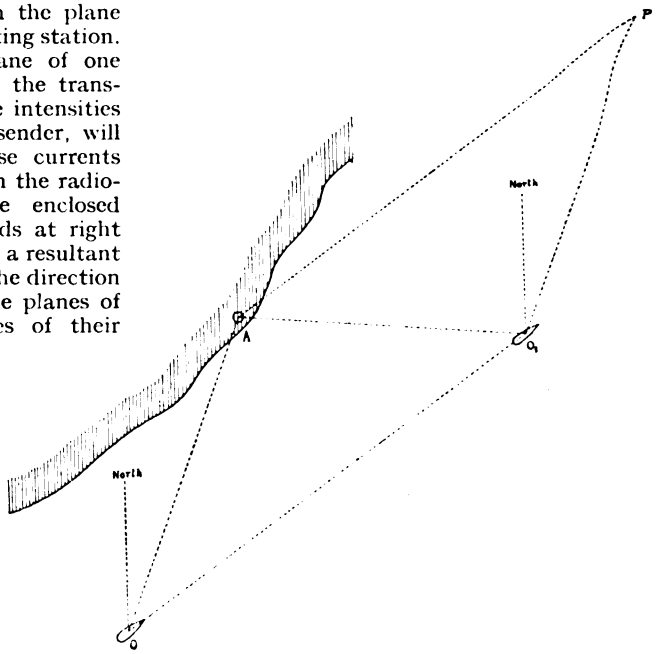


*Fig. 5.*

is now taken, and the position worked out as follows: a line to represent the course is drawn on the chart; a line, A P, is drawn parallel to the course and equal to the distance covered in the intervening time between the readings. Lines from the station, A, making the read angles with the course are drawn; then from P a line is drawn parallel to the first line, O A. The intersection of this line with the second line, A $O_1$, gives the required position.

An important feature of the wireless compass is that it not merely enables a vessel to locate its own position, but also that of an approaching vessel. The simplicity of the apparatus is another strong point in its favour.

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## The War Office and Wireless Telegraphy

MAJOR GUEST asked the Secretary of State for War on August 5th whether he had considered the various recent developments in wireless telegraphy, and the desirability of the more extended application of this science for military uses in the field,

[Photo Vandyk.
*Sir Henry Norman, M.P.*

and what action he proposed to take in the matter. Colonel Seely replied that his attention has been called to the recent remarkable developments in wireless telegraphy, and he had decided to appoint a committee to consider the application of these developments to the needs of the Army. The members who have consented to serve on this committee are :

Major R. H. Boys, D.S.O., R.E.

Mr. E. Russell Clarke, barrister-at-law.

Mr. H. A. Madge, expert in wireless telegraphy at present in H.M.S. " Vernon."

Colonel R. D. Whigham, D.S.O., of the General Staff.

Sir Henry Norman, M.P., will act as chairman of the committee, and a General Staff Officer will act as secretary.

The chairman of the committee, Sir Henry Norman, is well-known to the public as a keen traveller and an accomplished man of letters, but wide as is the range afforded by these subjects it has not been able to definitely limit his attention. The *World's Work*, which he founded in 1902, and of which he was for many years the editor, is a permanent witness to his sympathy with all branches of enterprise, whether commercial, scientific, or artistic. Sir Henry has always made the study of electricity one of his hobbies, and has followed the progress of wireless telegraphy with enthusiasm. He has a private wireless station in the grounds of Honeyhanger, his home at Hazlemere.

Mr. E. Russell Clarke, the other member of the committee whose portrait we present on this page, was born in 1871, and was educated at Charterhouse and Pembroke College, Cambridge, where he took a first-class in the Mathematical Tripos of 1893, and was equally successful in the Mechanical Science Tripos of the succeeding year. He then turned his attention to the Law, and became a barrister of the Inner Temple in 1895. He is attached to the North-Eastern Circuit, specialises in cases of a scientific nature, and has an expert knowledge of the laws on patents, designs and trade-marks. He is an associate of the Institution of Civil Engineers, an associate and member of Council of the Institution of Electrical Engineers, and a member of council of the Institution of Automobile Engineers. For the last ten years Mr. Clarke has been closely interested in the development of wireless telegraphy, and has erected two stations, one in London, and one at Penbyd wl, Abergavenny, in Wales.

[Photo Elliott & Fry.
*Mr. E. Russell Clarke.*

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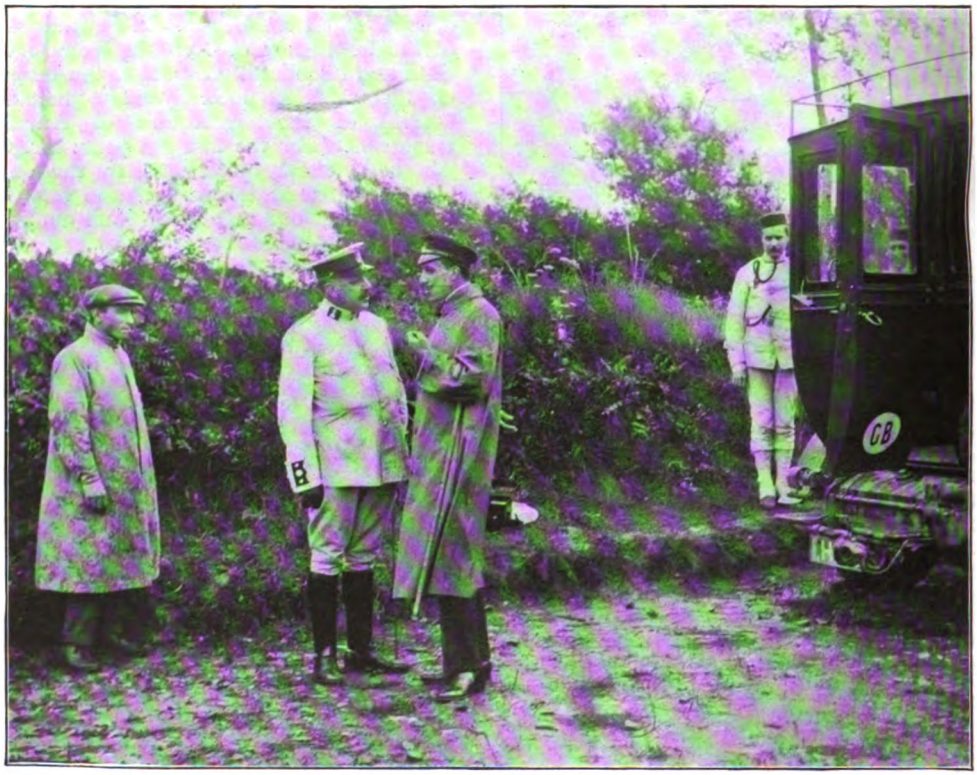
# Portable Wireless Telegraph Stations

## Demonstrations in Spain

IT is about ten years ago that the first experiments with portable wireless telegraph stations were made. The thoroughness with which the task was undertaken rapidly eased the mind of any doubts lest this brilliant application of electrical discoveries should, like some others, fall short in satisfying the requirements of practical use and be relegated to the region of imperfect inventions or unfulfilled hopes. Far from this being the case, the nature of the development has been a revelation to those who were not aware of what was transpiring on account of the wide variety of portable wireless stations that are now available. Demonstrations with portable wireless stations have been given practically all over Europe, and the result of these demonstrations has been not only successful from the commercial point of view, but the features revealed in the working of portable stations under service conditions has enabled the Marconi Company to carry out from time to time valuable modifications and improvements to the apparatus.



*King Alfonso of Spain conversing with Commandante Sr. Castañon.*

The latest series of demonstrations with portable wireless telegraph stations was carried out in Spain during the past month, and one has only to refer to the reports which have appeared in the newspapers of the country to learn that the demonstrations were an un-

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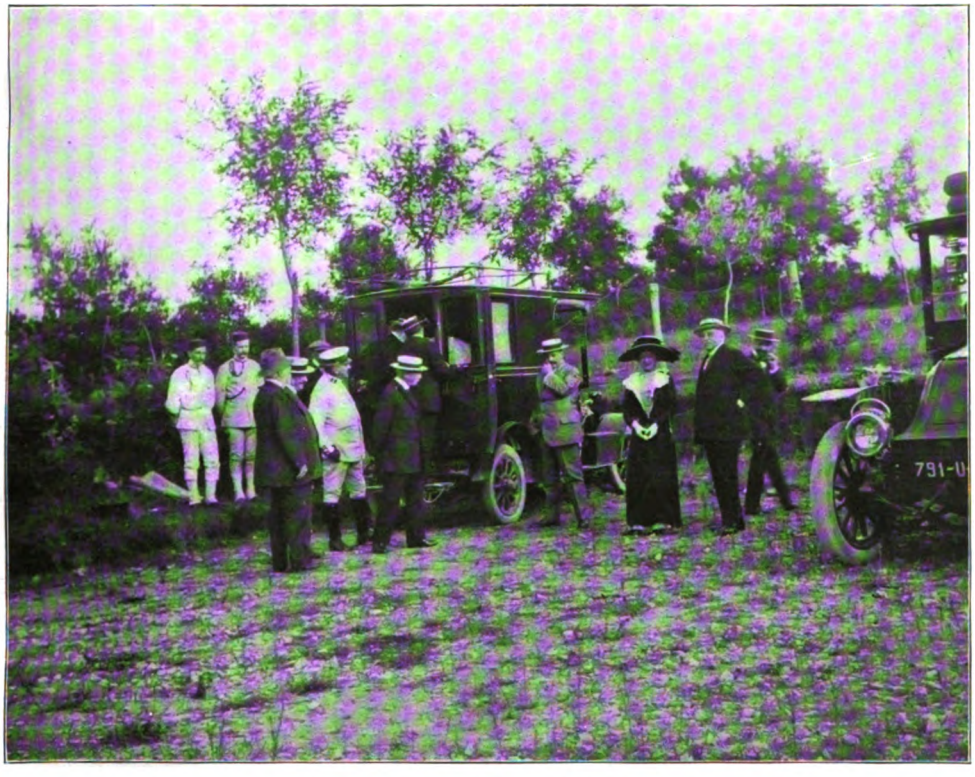
qualified success. They were carried out in the presence of the military authorities, and the apparatus were subjected to rigorous tests under conditions approximating as closely as possible to those obtaining in actual service. But interest in the trials, though primarily centred among the Chiefs of the Spanish Army and experts, far transcended those relatively narrow limits; civilian authorities and the Press displayed no less real interest in the proceedings; while His Majesty King Alfonso XIII. and the Queen Maria Christina honoured some part of the demonstration with their presence. The attendance of the Royal head of the State and his mother testified once more to His Majesty's keen interest in wireless telegraphy and his desire to see it applied as widely as possible in the interests of his country and the welfare of his subjects.




*Automobile Station erected at Mount Ulia.*

The demonstrations were carried out with three types of apparatus—viz., 1½-kw. cart station, 1½-kw. automobile station, and ½-kw. cavalry station. The Spanish military authorities were represented by Commandante Sr. Castanon and Lieutenant Sr. Montaud, both of them distinguished officers who have done much valuable work in connection with the radiotelegraphic services of Spain. With them were Lieutenant Sr. Paul, Lieutenant Sr. Alvarez, and Lieutenant Sr. Azcarate. The Compania Nacional de Telegrafia Sin Hilos were represented by Conde de Albiz, Captain Guillermo Ortega, and Lieutenant Don Manuel Moreno Quesada; and Marconi's Wireless Telegraph Co., Ltd., by Major J. E. Cochrane, D.S.O., the Chief of the Field Station Department, under whose direction similar important demonstrations have been carried out in several countries of Europe. Assisting Major Cochrane were Mr. Simeon and Mr. Eisler (engineers) and Messrs. Sadler and Welpley (operators).

The demonstrations commenced on Monday, July 22nd, at Madrid, when 270 feet masts were erected at the Marconi Practice School, and the cart and automobile stations were tested at Carabanchal and Aranhuez. On the following day the Cavalry station was erected, and this, together with two knapsack stations, was inspected by various public officials. On 24th July the Cavalry station proceeded with a

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*Motor Car Station erected on the Tiro de Pichon, La Granja.*

detachment of Royal Engineers to Villalba, and after performing good work it proceeded to La Granja, where it remained for some days.

It will enable the reader to understand readily the ranges covered by presenting in tabular form the distances between the stations and the magnetic bearing :

| Stations. | Distances. Kilometres. | Magnetic Bearing. ° |
|---|---|---|
| Madrid—Villalba ... ... ... | 32 | 320 |
| Madrid—La Granja ... ... | 65 | 320 |
| Villalba—La Granja ... ... | 36 | 320 |
| Madrid—Segovia ... ... | 75 | 320 |
| Segovia—San Sebastian ... | 330 | 30 |
| Madrid—Burgos ... ... ... | 220 | 355 |
| Burgos—San Sebastian ... ... | 180 | 52 |
| Madrid—Vitoria ... ... ... | 290 | 15 |
| Madrid—San Sebastian ... ... | 360 | 20 |

The demonstrations commenced on Monday, July 29th, when a short-distance test with a knapsack station was made at La Granja, communication being excellent. The cavalry set and the 1½-kw. automobile set were in constant communication with the 1½-kw. cart station at Madrid. During the course of the afternoon the officers from the Artillery College visited the stations and displayed great interest in their working. On the following day the automobile station left La Granja for Aranda de Duero, which was reached about 5.30 p.m. The station was immediately erected at the latter place, and communication established. Madrid was called on the following morning, when the signals were found to be very good. A move was made to Burgos late in the afternoon, where the automobile station was erected on an excellent site 2 kilometres out of the town, and work was commenced on the morning of Thursday, August 1st, the signals being very good. There is a large garrison stationed at Burgos, and many of the officers visited the scene of wireless operations. To give further extracts from the official records of the tests would be simply a repetition of the successes gained during the first week over varying ranges. The Spanish Press published eulogistic accounts of the operations, but before

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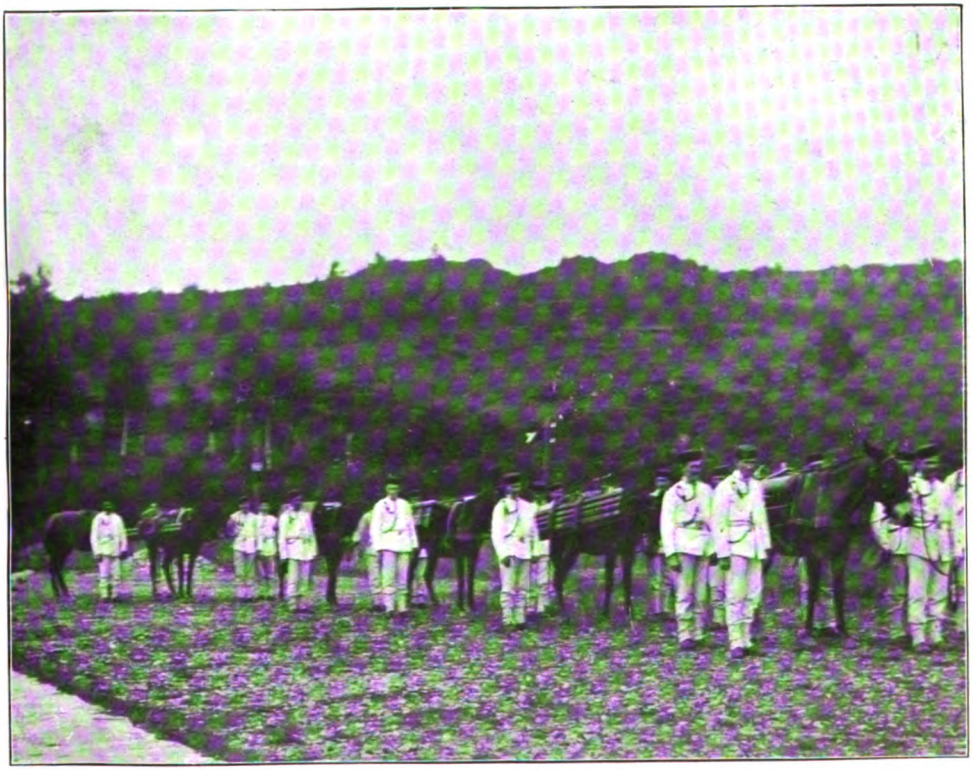
quoting some extracts it is well to note that the Queen-Mother witnessed a demonstration on August 9th, and His Majesty King Alfonso XIII. on August 13th. As to these Royal visits, and to the demonstrations in general, we cannot do better than to refer to the following account, which was sent to the *La Correspondencia de España* of Madrid on August 12th by its correspondent at San Sebastian :

" The Marconi automobile military station erected on Mount Ulia is being visited by many distinguished persons, who express admiration for its accurate working. Recently, and in the presence of the Queen Dona Maria Christina, trials were performed with a cart station between Segovia and La Granja. Señor Montaud, lieutenant of Military Engineers, explained to Her Majesty the Queen-Mother the complicated mechanism of the station, and communicated with another Marconi station installed on the cruiser ' Princesa de Asturias,' at anchor at Santander, messages being freely exchanged between these two wireless stations. A knapsack station installed at the Tiro de Pichon was then set in operation, and exchanged messages with a station of the same type at Mount Igueldo. The Queen Doña Maria Christina expressed great satisfaction with the demonstrations, which were also attended by the Marchioness de Martorell, Marquis de Aguilar de Campoo, General Sanchez Gomez (Chief of the Military Household of the King), Captain-General Sr. Bazan, with his A.D.C., Doctors Grinda and Alabern (Major of Engineers), Sr. Castañon, and various other distinguished persons. A Marconi cavalry station has arrived here also, and will be reviewed by His Majesty the King."

From the same source we cull the following, which relates to the visit of King Alfonso on August 13th :

" The King left the Palace at 3 p.m. and motored with Prince D. Felipe to Mount Ulia. Here the Royal visitors were received by Captain-General Sr. Bazàn, Conde de Albiz, Colonel Echagüe, and other officers. The King next visited the tennis-ground, where the stations had been erected by a section of the Telegraph Company of the 5th Mixed Regiment of Engineers, who are



*Cavalry Station (Mounted) for Inspection by King Alfonso at Mount Ulia.*

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in garrison in this town. The King reviewed the Marconi Cavalry and automobile stations, and at his request the officers in charge of the latter communicated with the cruiser 'Princesa de Asturias,' anchored in Santander. The King spoke highly of the installations."

The following is from the *Ecos* :

"King Alfonso drove by motor-car from the Palace to the Ulia Mountains, where he visited the Marconi portable stations which were there being tested. His Majesty praised the stations, and directed that communication should be established with the cruiser 'Princesa de Asturias,' anchored in the port of Santander."

Finally, we may close this brief account of a series of valuable demonstrations with the following from *El Imparcial* of August 14th :

"In spite of the inclement weather, the King, with the Infante D. Felipe, the Captain-General, and several Engineer officers, visited the Ulia Mountain in order to be present at the wireless telegraph demonstrations. From this point the King sent a radiotelegram to the cruiser 'Princesa de Asturias,' inquiring from the commander of the fleet as to the state of the weather in the port. Later he witnessed the operation of the ½-kw. cavalry station, and afterwards received a reply to his message from the Commander of the Fleet, stating that a northerly storm was raging, and that the crew saluted the King affectionately. The Royal visit lasted one hour, and His Majesty was highly pleased with what he had witnessed."

*King Alfonso inspecting Marconi Automobile Station at Mount Ulia, San Sebastian.*

The tests that the Colombo wireless station has been undergoing for some time have been completed, and have proved very satisfactory. The record for the longest distance wireless messages ever sent in the East was created by the Colombo station when they spoke to Sabang, Sumatra, 1,007 miles away.

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# The Marconi Agreement with the Government

ON Wednesday, August 7th, the Postmaster-General, Mr. Herbert Samuel, explained to the House of Commons the agreement which had been entered into with Marconi's Wireless Telegraph Co., Ltd., which made public the story of the lengthy negotiations which took place prior to an agreement being arrived at.

The scheme for the erection of stations, putting this country and all the Crown Colonies and the Dominions beyond the seas into communication with each other by wireless, originated with the Marconi Company in a letter which it addressed to the Colonial Office in March, 1910.

This communication informed the Government that it was the intention of the Marconi Company to erect a chain of stations round the world, and that they desired that these stations should be erected on British soil.

They asked the Government for a licence enabling them to erect them at their own cost, and to conduct a telegraph service for a period of twenty years, at the end of which time the Government were to have the right to purchase.

The matter was considered by the Cable Rates Committee, a sub-Committee of Imperial Defence, and subsequently by the Imperial Conference, and all these bodies came to the conclusion that whilst these stations ought to be erected at various points of the Empire, they should be State-owned.

When the Imperial Conference came to that conclusion, the Postmaster-General took steps to form a special committee to work out the scheme.

This committee first met on August 20th, 1911, and, after considering where the stations should be erected, they commenced to consider what steps ought to be taken for the erection of the stations.

They concluded that three courses were open: The Government might take steps to erect the stations through their own engineers and officers, they might invite tenders from contractors who were in a position to erect them, or they could negotiate with the Marconi Company, who had expressed their willingness to carry through the scheme.

It was decided that the stations could not be erected by any of the Government Departments, and a large committee considered whether or not the matter should be thrown open to public tender.

After investigation, however, it was clear that no company in the world other than the Marconi Company had had any experience of long-distance wireless telegraphy, and the committee therefore decided that it was not advisable to throw the contract open to public tender.

On August 9th, 1911, the committee decided that it was advisable that the Government should consider in full detail the second offer, which had been made in April, 1911, by the Marconi Company.

Under this offer the Company were willing to sell to the Government their rights for long-distance stations for non-commercial purposes, and to erect the stations required.

This offer, however, was eventually declined.

A series of interviews with the managing director of the Marconi Company followed throughout the late autumn and winter, as a result of which the company received an offer from the Government which it declined.

Upon that the Postmaster-General convened a further meeting of the large committee on December 15th, 1911, and reported that the negotiations with the Marconi Company had resulted in an impasse. The meeting was of opinion that the lump sum asked for as user of the patents by the various departments was too high, and in this opinion the Postmaster-General concurred.

The negotiations on these lines therefore were broken off.

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In respect of the erection of the stations for the Imperial chain the committee decided to appoint a technical sub-committee to go into the details of cost of erecting the stations on the assumption that they were going to be erected by the Government.

This technical sub-committee consisted of three Admiralty experts, one War Office expert, and three Post Office experts.

After a minute examination they ultimately reported that without any question of royalty, and dealing only with the cost of the erection of the stations themselves, they estimated that the erection alone by the Government would average £60,300 per station, excluding the cost of the sites, but including buildings and foundations. In this calculation, however, no allowance was made for general office charges, and was based on the erection of simplex stations instead of duplex stations as offered by the Marconi Company.

There also remained the question of royalty, for, if the Government erected the stations, they would have to use the Marconi patents, and would consequently have to pay royalty upon them.

Negotiations were then reopened with the Marconi Company upon a different basis, dropping altogether the question of the payment of a lump sum in consideration of the right to all Government Departments to use the Marconi patents for non-commercial purposes, and eventually terms were agreed on March 7th, 1912.

The above, as was stated by the Postmaster-General, constitutes shortly the history of the negotiations with the Government for the construction of the Imperial stations.

Directly the company's tender was accepted on March 7th, the directors immediately, and on the same day, issued a circular to the shareholders informing them of the fact.

The agreement, however, had to be drawn up, which required a good deal of consideration and further negotiation in respect of many of the details, and it was not finally completed and ready for signature until July 19th, 1912, when it was signed.

The Marconi Company, although naturally anxious to conclude the contract with the Government were nevertheless unwilling to do so unless satisfactory terms could be arranged. They preferred to risk seeing what they were satisfied would be fruitless attempts made by others to construct the stations than to give to the Government without reasonable consideration the result of many years' work and experience which had cost them hundreds of thousands of pounds.

During the whole of the negotiations up to the final acceptance of the tender, the Company remained in doubt as to whether the contract would be entered into, or whether an attempt would be made by the Admiralty to construct the stations themselves.

## Draft Specification

BELOW we present an abstract from the draft specification, submitted by the Marconi Company, descriptive of the wireless telegraphic installation under the contract for the Imperial wireless stations :

*The installation* to be designed for efficient transmission at full power, and to be capable of transmitting to the distant station, with which it has to communicate, at all times of the day and night.

*The wave-lengths* of all stations in connection with the Imperial scheme shall be as great as possible within the limits of 17,000 ft. and 50,000 ft. (consistent with keeping the capacity inductance and size of the aerials within reasonable limits) in order to ensure reliability of reception at all times of the day and night, but the wave-lengths transmitted from any one station will be in all cases at least 25 per cent. different from those transmitted from other stations within its normal range, and with which it has to communicate. In the case of the English station, the wave-length chosen for communication with Egypt will be 30,650 ft. approximately. In all cases throughout the Imperial scheme there will be a difference of 5 per cent. between the wave-lengths emitted from any one station in order that each corresponding receiving station with which this station has to communicate may be able to tune out the waves emitted by the said station for the other station or stations with which it is also communicating. In the case of the English station the above-mentioned wave-length of 30,650 ft. has been chosen in order that there will be no mutual interference with other high-power stations existing or in contemplation within the range of the English station. Each station shall be capable of communicating with its respective corresponding stations at all times, and in order to effect this the station will be designed with high aerials and considerable reserve of power over what is required theoretically to bridge the respective distances ; and, furthermore, where a station is required to communicate in more than one direction, separate transmitting circuits to be provided, and in such cases the characteristics of each transmitting circuit will be identical, except in so far as it is necessary to vary the inductance of the H.F. circuit according to the wave-lengths to be transmitted.

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The note of each station will be different from those of any other station within its range, but the notes of each transmitting circuit in any one station shall be identical. Facilities shall be provided, however, for slightly altering the note of any one of the transmitting circuits in case it may be found at any time desirable to do this.

In order to standardise the apparatus so that the staff of one station shall be equally competent to look after the plant of another station, the power plant and heights of the aerials and types of machines and apparatus shall be, as far as practicable, the same in each case, and the types of prime mover and generator shall be, where possible, identical in each case.

*Aerials.*—The size of the aerials in each case to depend upon the length of wave emitted. The capacity of the aerial shall be such that under working conditions the voltage shall not rise sufficiently to produce a bright brush discharge. The length of each wire used in the aerial shall be electrically identical, and the wires shall be insulated throughout their length. The transmitting aerial to be of the multi-wire directional type—*i.e.*, with the centre line through the horizontal portion of the transmitting aerial coinciding with the line of direction of the station with which it is required to communicate, the free or elevated end of the aerial pointing directly away from the communicating station. The English aerial to consist of a number of parallel wires, each wire being composed of seven strands of No. 19 S.W.G. silicon bronze wire. Each wire will be over 3,000 ft. long, and insulated throughout its entire length. The aerial will be supported by 10 sectional tubular steel masts, each 300 ft. high. The aerial will be suspended from the various triatics by means of porcelain rod and reel insulators. The aerial will pass freely through the porcelain reel which is attached to the bottom of the porcelain rod insulator. The triatics will be made of 1½ in. circumference extra flexible steel wire rope, having a breaking strain of 7½ tons.

*Masts.*—The masts for supporting the aerial shall be of the 2 ft. 6 in. sectional steel tubular type, and shall be 300 ft. high in each case. The aerials to be supported on triatics stretched between pairs of masts. Each mast to be capable of withstanding a permanent horizontal strain of not less than 2 tons at the head of the mast, in addition to windage calculated at the rate of 30 lb. per effective square foot. The masts will be provided with a suitable number of steel wire guys insulated from the masts and attached to anchor blocks set in the ground.

*Earth System.*—This system to consist of a series of galvanised iron plates buried in a suitable position relatively to the station house. This arrangement to be supplemented by a number of horizontal wires running to the boundaries of the site. The set of plates outside the building to be connected by suitable leads and carried into the building and thence to the various circuits.

*Power Plant.*—The power plant to be in duplicate, and to include two steam boilers (each capable of evaporating sufficient water for the whole requirements of any one transmitting circuit). In the case of stations required to send in two directions three boilers are to be provided; and in the case of stations such as the one in East Africa, required to transmit in three directions at the same time, the station is to be provided with four boilers.

It is mentioned that the prime mover in each case is to be a steam turbine, direct coupled to an alternating-current generator, which in turn will be coupled direct to a Marconi revolving disc discharger. Excitation for the alternators will be provided by two 110-volt turbo-generators, which will also supply the lighting of the building, fans, etc. The total power at the terminal stations to be 1,300 H.P., and at the intermediate stations to vary from 1,900 H.P. to 2,500 H.P., according to the locality, range and number of directions in which transmission is required.

Each boiler to be of the water-tube type, to have a grate area of not less than 3,000 sq. ft., to be designed for a working pressure of 200 lb. per sq. in., and to be provided with superheaters capable of raising the temperature of the steam by 200° F. of superheat.

The condensing plant to be in duplicate and of the surface type.

*Transformers.*—Each station to be provided with five transformers for each transmitting circuit.

*Inductances.*—The inductances for regulating the condenser charging circuit to be of the Marconi latest improved air-core type. Other air-core inductances to be provided, placed in the leads from the secondary inductances to the condensers for the purpose of preventing surges of voltage being set up in the transformers.

*Shunt Protectors.*—Shunt protectors of the graphite or lamp type to be provided as shunts across the windings of the fields and armatures of all machines in the station in order to prevent oscillations being set up in the various windings of these machines.

*Condenser Bank.*—The station to be provided with a separate condenser bank for each transmitting circuit, consisting in the case of the English station of 540 cells. Each cell to be of special and improved design, consisting

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essentially of the same number and type of plates as in the original Poldhu jar type of condenser, but these plates to be mounted in a special form of ironstone containing vessel. The containers to be self-insulating, thus dispensing with the necessity for the provision of insulated stands. Further, the lids of these containers to be provided with a heavy oil seal to prevent the internal insulation being affected by moisture reaching the inside of the condensers. Each cell to be provided with high-tension terminals connected to the plate lugs, and formed to take the external 'bus bars in a convenient fashion. The connections between the individual cells will be formed of copper strip. The whole design of the transmitting circuit to be such as to obviate the necessity of any changing in the grouping of the condenser cells, the capacity in this circuit being kept at a fixed value, and any required variation in wave-lengths being obtained by regulation of the inductance of the jigger primary winding or the connections thereto. The main 'bus bars from the condenser to lead to the jigger and discharger and to be so arranged as to reduce the inductance of these leads to as low a figure as is required. The leads from the 'bus bar connections to be so arranged that the spare alternator and disc can be quickly connected thereto, and the other disc disconnected.

*Disc Discharger.*—The station to be provided with one disc discharger for each transmitting circuit and one spare. Each discharger to be of the Clifden type, modified to suit the requirements of this service, with special side electrodes, and provided with the necessary number of studs. The disc will be provided with an insulated coupling between the disc and alternator shaft, and means will also be provided for driving the disc from an independent motor.

*Transmitting Jigger.*—One transmitting jigger to be provided on each circuit for use on the full power of the installation, the jigger to be provided with a multi-stranded primary conductor arranged in conformity with the latest type of jigger as used at our Clifden station; the secondary of this jigger to consist of a special solenoid winding of similar cable to the primary winding, but of smaller size. The primary and secondary windings to be entirely separate, and the secondary to move laterally with regard to the primary to enable the coupling of the two circuits to be varied.

*Aerial Tuning Inductances.*—The stations to be provided with aerial tuning inductances of an approved design.

*Signalling Gear.*—The station to be provided with not less than three relay operating high-tension signalling switches on each transmitting circuit, which will be inserted on the lead from the low-frequency inductance to the condenser bank, thus affording control over the charging current to the high-frequency primary circuit. Above the high-tension signalling switches will be installed isolating switches to enable any of the switches to be connected or disconnected at will. The electro-magnets of the high-tension signalling switches will be operated by means of a relay current, the relay being situated in the transmitting station. The relay will, however, be operated by means of a Morse hand key, situated in the operating station several miles away. The relay will also be capable of being operated by means of a Wheatstone or other automatic transmitter, also situated in the operating house, and means will be provided to enable the operation to be carried out by hand or automatic at will. The transmitting station will, however, be provided with a Morse hand key to enable signalling to be carried out from the transmitting station should it at any time be necessary to do so.

As regards the receiving and operating stations, they are not to be less than 10 miles distant from the transmitting stations. The receiving aerials are to consist of one or more silicon-bronze stranded conductors supported by sectional steel masts 300 ft. high. The receiving aerial is to be erected parallel with the centre line of the transmitting aerial, and in the case of the English station the receiving aerial wires will be approximately 8,000 ft. long. This aerial is to be supported by sectional steel masts each 300 ft. in height, the masts to be of the sectional tube pattern, efficiently guyed and connected to anchor blocks by flexible steel-wire stays suitably insulated from the masts. The earth system is to consist of a number of galvanised iron plates buried in a suitable position relative to the receiving house, and at a radius of 200 ft., and connected to the receiving circuit by a number of radial galvanised iron wires, the earth system being further supplemented by a number of similar wires attached to the outer plates and running below the horizontal portion of the directional receiving aerial. The operating room is to be furnished with Morse hand keys and Wheatstone or other similar type of automatic transmitters with suitable switch arrangements, so that operating can be effected either by automatic transmitter or by hand key.

The receiving station will be further provided with a small outbuilding containing a 5-H.P. petrol engine, coupled to a direct-current dynamo, for supplying lighting to the building and current to the operating line. A storage battery of adequate capacity also to be installed, so that current can be taken from the battery or generator at will.

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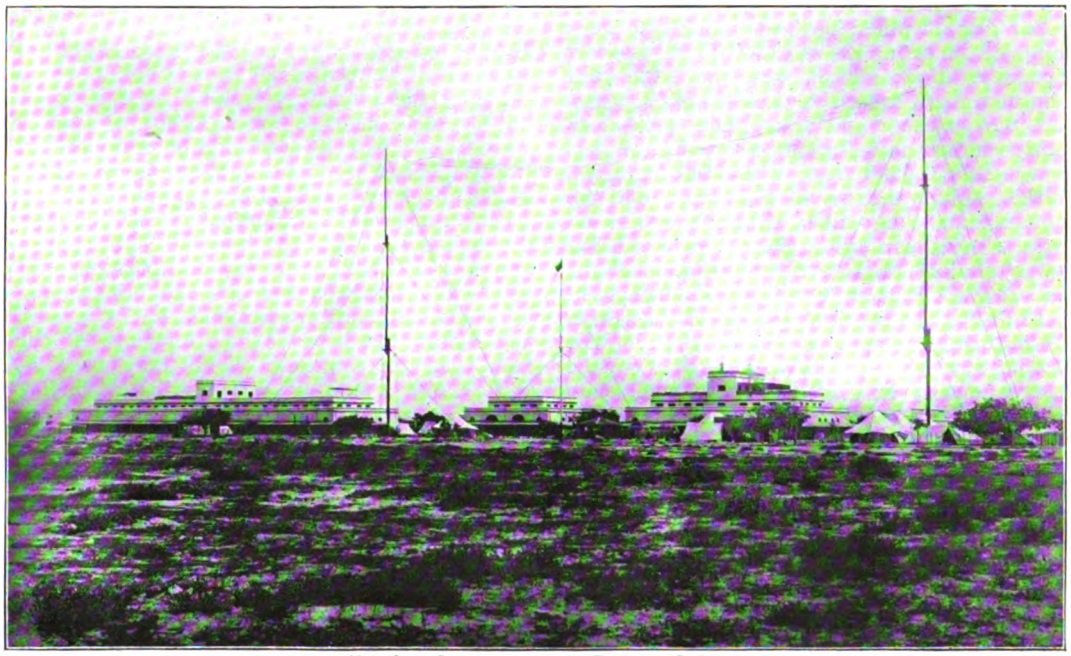
# A Long-Distance Record

THERE is something out of the way about Persia. It is, as it were, a bit of the old world dumped down into modernity, and though the saying should seem hard to those who are lovers of the land of "the Lion and the Sun," there is no doubt that it accurately expresses popular opinion of the West with regard to this comparatively little-known country. The fact of its isolated position on the map must bear the responsibility for this state of things. It is hemmed in on the north and east by Russia and India, and possesses a coast line which only commands a byway of the Arabian Gulf. Another hindrance to progress is the lack of good roads in Persia, which, except for one or two connecting the great cities, are merely caravan tracks, owing to the mountainous character of the interior of the country. Means of communication with the outer world are therefore scanty and unreliable, and until this is remedied progress must necessarily be slow.

There are, however, signs of awakening on the coast, for the mountain ranges and plateaux diminish in height as they approach the sea, and leave a comparatively flat coast line.

Bushire is a growing centre of trade, and is connected through Jask by telegraph with stations on the delta of the Indus. At Jask there is also a wireless station, which was erected for the Government some three years ago by the Marconi Company. A view of this station is shown in the accompanying illustration.

The operator in charge of this station was recently able to cover a remarkably long distance, his messages being received by the operator on the P. and O. liner "Mantua," which was then off the Port of Melbourne, a distance of 6,249 nautical miles away. At the time the message was received the "Mantua" was just outside Port Phillip Heads. It is only possible to account for this long distance by some exceptional condition of the ether at the time. The operator on the "Mantua" heard Jask as clearly as if the stations were only 100 miles away. The "Mantua" is equipped with a Marconi 1½-kilowatt installation, standard ship type, in which the Marconi magnetic detector, which on several occasions has proved its great ability, is employed.



*Wireless Station at Jask, Persian Gulf.*

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# The Effect of Daylight upon Radiotelegraphic Waves

**By Dr. W. H. Eccles**

DR. FLEMING'S interesting note in the August number of THE MARCONIGRAPH contains several suggestions as to the probable cause of the difference between night and day signals, but does not refer to a theory of mine which I included in a paper read before the Royal Society last June. I therefore now write a short sketch of this theory for THE MARCONIGRAPH as a kind of supplement to Dr. Fleming's article.

But first, it would be best to indicate some points of the article on which comment appears necessary. For instance, speaking of the solar eclipse on April 17th last, Dr. Fleming suggests that the eclipse might have been utilised to decide whether any effect is produced on signals (presumably signals *received*) by the incidence of the conical shadow of the moon on the antenna; and some time after the eclipse he put the point to Captain Ferrié, of the Eiffel Tower station, who answered that a slight increase of the strength of signals had been noted during the eclipse. Presumably this was an impression, not a measurement. Dr. Fleming says: "This result agrees with certain observations of Dr. Eccles in England. One would need to be able to command the service of a good many prolonged total solar eclipses to make all the control experiments necessary to settle how far the effect is due to an action on the antenna itself and how far it is due to an action on the surrounding air." Surely this is the first time in wireless telegraph history that anyone has seriously proposed that the incidence or non-incidence of sunshine on an antenna can in any way affect the intensity of signals received by the antenna. The proposition does not appear to receive support from any known physical fact. Of course, the possibility that light, especially ultra-violet light, might affect the waves *emitted from* an antenna is well known, and is, indeed, described in the paragraph preceding the one now under criticism; but this possibility has nothing in common with the impossibility of the illumination of an antenna to affect the signals received.

In the quotation given above, Captain Ferrié's statement that the strength of signals was slightly increased during the eclipse is said to agree with the observations made in my laboratory at the Grosvenor Canal. Those observations were chiefly directed to the measurement of the integral intensity of the strays (or X's) that came in during the eclipse, but notes were also made of any signals that happened to come in. The curves of integral intensity were published in due course; they show two maxima and one minimum. The larger maximum was about three times as great as the normal integral intensity before or after the eclipse, and the minimum was slightly smaller than the normal. This implies that fluctuations of about 200 per cent. in intensity were perceived. As near as could be judged by ear, the intensity of such signals as happened to come in went through similar variations to those of the intensity of the strays. This is not a "slight increase" of intensity, but rather a great one. A good confirmation of my results was published by Schledermann in the *Electrician* of May 31st. He says there was a "very remarkable strengthening of signals," and he measured it.

I may add that we really do not need total solar eclipses to help us decide whether antenna illumination affects transmission (or reception). The matter has been decided long ago by the fact that the blackest cloud may cast its shadow over a sending station without bringing red . . . . from the receiving station. It has also been sufficiently settled by the consideration that if the night-day effect were due to alteration of illumination produced by sunrise or sunset at the sending station, then the effect would be just as perceptible over short ranges as over long—which is not the case.

In the article a suggestion is revived to the effect that the upper layers of the atmosphere, when in full sunlight, may possess some property which causes electric waves to travel more slowly there than in the lower atmosphere. If this were so, electric waves starting horizontally would be deflected away from the earth in a manner analogous to the deflection of sound waves started horizontally in an atmosphere that has its upper layers cooler than its lower layers. The particular property suggested by Dr. Fleming is that of specific inductive capacity, and he urges that the upper layers may possess a specific inductive capacity greater than that of the lower layers. There does not seem to be any convincing evidence in favour of such a suggestion; indeed, the suggestion won't bear close examination; but if it be accepted provisionally it will be found to carry us only a very small way towards

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understanding the known facts of long-distance propagation. It certainly promises to be useful in explaining Marconi's 1902 experiments, when, on a voyage to America, Marconi discovered that Poldhu could send only 800 miles by day but 2,000 miles by night; but when the hypothesis comes to be applied to Marconi's more recent statement that with the very long waves used of recent years the day signals are better than the night signals across the Atlantic, it breaks down utterly and finally.

Last summer I spent a good deal of time trying to fit a similar hypothesis of outward bending of the waves to the phenomenon of the sudden transient cessation of strays at about ten minutes after sunset—a phenomenon independently discovered and investigated, I believe, by Dr. Marconi and his research staff and by myself in 1909; and I failed to make the hypothesis work. In the late summer I attacked mathematically the problem of the propagation of electric waves through ionised air. This investigation, which is given in full in the Royal Society's paper already cited, showed that under the conditions probably ruling in our atmosphere the velocity of propagation is increased by ionisation. This alteration of velocity—which, be it noted, is precisely opposite to that postulated by former writers (it is an increase, not a decrease)—is not due to mere increase of the conductivity of air when ionised by sunlight. Increase of conductivity depends on the number merely of ions per unit volume, while the velocity change depends on other properties of the ions—properties which are quite in accord with the known effects of ultra-violet light on air. In the paper facts are advanced to show that an electric ray starting from the earth's surface in a direction inclined slightly upward will follow a straight line in the lower atmosphere and a curve bending downwards in the middle atmosphere. If its curvature here is on the average greater than that of the globe the ray will be turned down to the lower atmosphere and again traverse a straight line, and will affect any antenna it meets, but otherwise it goes further and further from the earth's surface, and is lost to us. It is also proved in the paper that the paths of long waves will be bent more than the paths of short waves, and, therefore, that long waves can bend round the earth much more perfectly than short waves. This accords very completely with all the published experimental facts that I have been able to find on long-distance transmission in daylight. But in order to go further it is found advantageous to combine with this new theory of ionic refraction the hypothesis which Heaviside proposed in 1900. This hypothesis is that there exists in the upper atmosphere a permanently ionised conductive layer that reflects electric waves. We assume that it reflects waves of all lengths equally well. Using this hypothesis, we see that at night, when the ionisation of the middle atmosphere has all died away with the vanishing of the sun, propagation of electric waves round the bend of the earth proceeds by repeated reflections under the electrical vault of the atmosphere in much the same manner in which waves of sound creep round a whispering gallery, with plentiful scattering downwards by irregularities. During the day propagation of long waves proceeds by the bending of the rays in the ionised middle atmosphere underneath the Heaviside layer, which evidently may be supposed to be put quite out of action.

---

### Absorption of Electric Waves

(*To the Editor.*)

SIR,—After reading Dr. Fleming's article in the August MARCONIGRAPH, "The Effect of Daylight upon Radiotelegraphic Waves," it occurred to me that a reason, or partial reason, might lay in the diurnal changes of the earth's magnetism. Reasoning the matter thus: A magnetic disturbance, such as an electro-magnetic wave, must be acted upon by the earth's magnetism in a damping manner; in fact, would be damped out in a short space of time. The time taken would depend upon the intensity of the disturbance, and inversely to the intensity of the earth's magnetism; the latter diurnally changes, increasing from morning till evening, and decreasing during the night; thus the life of a wave during the day would be shorter than a similar wave at night.

Analogy may be found in the vibration of a stretched string which gives larger and slower vibrations for a longer period, with a certain expenditure of energy if stretched to a low note than to a high one; the strain on the string corresponding to the earth's magnetism, the vibrations to the electro-magnetic wave, and time taken for vibrations to die out, to the life of a wave.

Yours, etc.,

Newbury. B. J. WHEELER.

---

Work in connection with the wireless installation in Karachi is in progress. The site selected is near the polo ground, between the station hospital and Napier Barracks. Mr. Parker is in charge of the work. Two masts already rise to a height of over 250 ft. A third one is in progress, and three more are yet to be erected. The Indian Telegraph Department will take charge of the installation.

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# Training Wireless Operators.

THE training school for operators at Marconi House, London, is now in operation, and is attracting much attention. The object of the Marconi school is to train men for the wireless service who have had some previous telegraphic knowledge. It is, in fact, a finishing school (and not a preparatory school) for those who have acquired telegraphic knowledge and wish to acquire a knowledge of wireless telegraphy so as to become operators. It has only recently been opened, and is still in course of organisation. It is intended to have several sets of apparatus in the school-room for the purposes of tuition, including ½-kw. set as used on cargo boats, having a range of about 100 miles under normal conditions; a standard 1½-kw. set as used on most ocean-going liners, and a 5-kw. set. The school is capable of accommodating 60 men, and the average course of tuition extends over about six weeks, when it is usually expected that the men should be qualified to pass the necessary examinations and obtain appointments. The demand for efficient operators is now very great, and men are continually entering the school and becoming qualified, even in shorter periods than stated above. The accompanying photograph shows one of the class rooms with a number of the students engaged in their work. Some, those with the telephones on their heads, are receiving from one who is transmitting. Others are acquiring a knowledge of the apparatus and diagrams, etc. Another illustration shows a portion of the instrument room, the operator being engaged on a 1½-kw. standard ship set. The school will be equipped with an aerial for sending, which will be suspended between masts at the top of the building, so that practical tuition may be given to pupils. It is expected that signals will be received from steamers passing up and down the Channel, and even at greater distances.

[Photo L.N.A.

*One of the Class Rooms at Marconi House.*

The problem of the training of wireless operators is now being dealt with in a whole-hearted fashion. There is an ever-increasing demand for qualified operators, and the Marconi companies have made arrangements for the training of men as wireless operators. Our readers are already familiar with the school at Liverpool, but this is no isolated example of the Marconi Company's efforts, for another school has been equipped at the head offices in London. There are also schools on the Continent. The latest school to be added is that in New York which the Marconi Wireless Telegraph Company of America have opened at 29 Cliff Street. Here a thorough course of instruction in wireless telegraphy will be given. The school has been supplied with all the latest wireless appliances, including a 2-kw. 240 cycle discharger transmitting set with switchboard and controlling appliances, and a 2-kw. quenched-spark set, with every necessary appliance for adjustment, and obtaining of resonance.

For daily instruction a standard auxiliary

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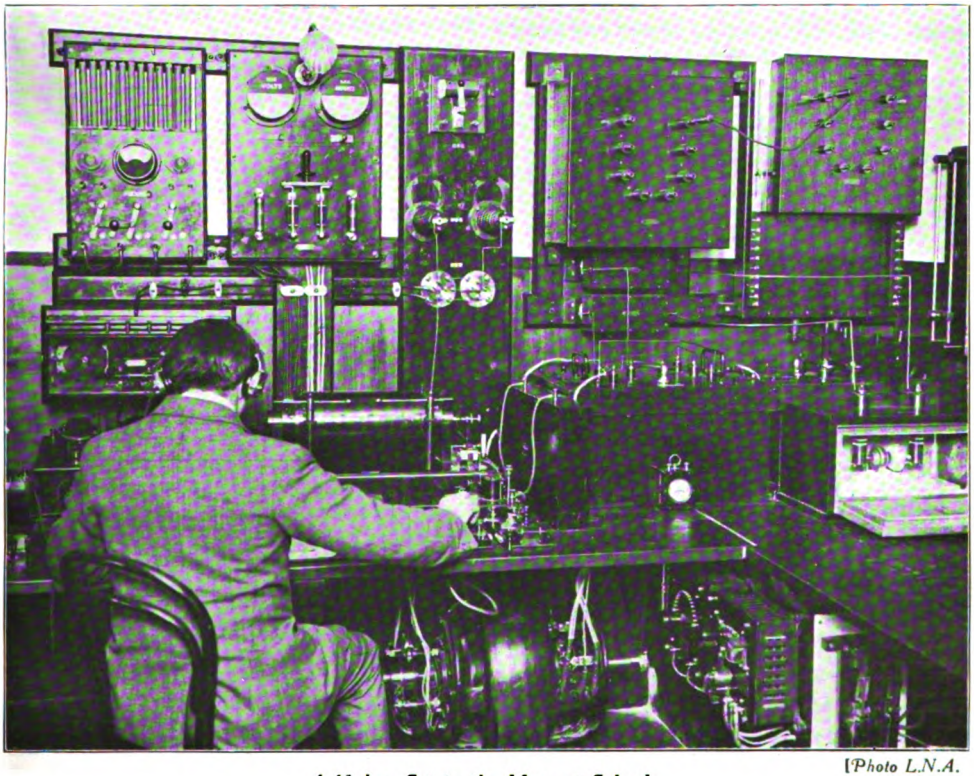
set with storage cells is in use, and there is besides a large amount of experimental apparatus to be used for demonstrating the application of electricity and magnetism to wireless telegraphy. In this equipment is included wave meters for measuring wave-lengths and obtaining resonance in transmitting circuits, while the decremeter, an instrument used in measuring the logarithmic decrement of damping, is another important addition.

In the class-room for continental code practice a Wheatstone transmitter has been set up, by which messages can be automatically sent to the class at any speed desired.



[Photo L.N.A.

*A 1½-kw. Set in the Marconi School.*

Before the pupil will be qualified to be admitted to a ship's position there will be certain company and Government examinations to be passed, and he will be required also to send and receive messages at a rate of 30 words per minute.

---

The Vienna *Reichs Gesetzblatt* publishes a decree concerning the establishment of a wireless telegraphy inspectorship in Trieste, and the installation and working of telegraph offices on ships.

**Correspondence**

(*To the Editor.*)

Somaliland Telegraphs,
Superintendent's Office,
Berbera, *July 30th*, 1912.

SIR,—The "wireless" staff of the Somaliland telegraphs desire to place on record their great admiration of the superb example set by the late Mr. J. G. Phillips during one of the most trying experiences in the history of wireless.

Every member of the wireless staff has been pleased to subscribe toward the cost of establishing the memorial, as has been so generously undertaken by the Mayor of Godalming and others. I have the honour to enclose herewith the list of subscribers and a cheque on my bankers for the full amount subscribed—*i.e.*, £2 6s. 6d.

I shall esteem it a favour if you will forward the latter to the proper quarter, as you so kindly offer to do in the July MARCONIGRAPH.

The staff wish to thank you, Sir, for the publicity given to the Memorial Fund, which has enabled us to do what we feel to be the duty of all interested in the working of wireless.

Yours, etc.,

BENJAMIN NEWTON, *Superintendent*.

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THE MARCONIGRAPH

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The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

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**PORTRAIT OF MR. PHILLIPS.** The Publisher begs to announce that he has arranged to supply portraits of the heroic Marconi Officer who lost his life as a result of the "Titanic" disaster at the following prices: Cabinet size, 1/9 each: Enlargements, 10 in. by 8 in., 13/-; 12 in. by 10 in., 14/-; 15 in. by 12 in., 17/6 post free. The portrait is by Miss J. Stedman of Farncombe, and is the same as that from which the illustration in the May number of THE MARCONIGRAPH was made.

### The Share Market

London, *August 22nd.*

Since our last issue prices in all Marconi issues have further suffered from the general depression in stock markets and rumours of immediate competition from rival concerns; these, however, need not be taken seriously, and although prices show heavy reductions, there are many indications that investors are coming forward and recognising the attractiveness of Marconis. Closing prices to-day: Ordinary, 4⅞; Preference, 4⅛; Canadian, 22s. 6d.; Spanish, 1—; American, 1⅛.

### Patents in the United States

The Marconi Company has received a Marconigram from their patent lawyers in New York, advising them that the Examiner of Interferences has awarded all priority to Mr. Marconi, disallowing the claims of Fessenden in respect of synchronously operated spark-gaps.

### Phillips Memorial Fund

Further donations to the amount of £51 3s. have been received in response to the appeal in THE MARCONIGRAPH on behalf of this fund. The total sum received by us is £89 8s., and a cheque for this amount has been sent to the Mayor of Godalming, in addition to the Marconi Company's donation of 50 guineas. There is every reason to feel gratified at the ready response from all quarters to the appeal, for donations have been received from many countries, including Canada, France, Spain and Belgium. The fund was inaugurated by the authorities of the borough of Godalming and the county of Surrey, and its object is to provide a suitable memorial to the heroism of the late Mr. G. Phillips, the wireless operator on board the "Titanic." It has been decided that this memorial shall take the form of a drinking fountain, to be erected at Godalming, Mr. Phillips's birthplace, and a committee has been appointed to arrange the site and approve designs. £500 was the sum proposed to be expended. The sum required to complete the scheme has not yet been reached, and the editor of THE MARCONIGRAPH will be glad to receive any further donations from readers.

* * * *

A memorial painting has been executed for the Godalming Grammar School from photographs of Mr. Jack Phillips. Present and Old Boys of Godalming Grammar School, where he was educated, provided the funds for the picture.

* * * *

A number of officers of the Maritime Association of the Port of New York recently met in

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the Maritime Exchange to consider proposals for collecting funds for the memorial to Mr. Jack Phillips.

The Maritime Association members believe that in view of the fact that so many Americans were saved through Phillips's devotion to duty that country should have a share in honouring his memory.

Mr. C. C. Galbraith is at the head of the committee which has charge of the raising of funds. The second member of the committee is Mr. H. H. Raymond, Director and General Manager of the Clyde and Mallory Steamship Companies. Mr. Willard U. Taylor, President of the Maritime Association, and Mr. William D. Dickey, Director, were present at the recent conference, and both heartily endorsed the movement to raise subscriptions for the Phillips memorial. The proposed memorial was discussed from every point of view. As a result of this discussion Mr. Galbraith said the committee may widen its scope, or another committee may be appointed, for there is a growing sentiment in favour of the raising of a general fund to be used in rewarding wireless operators who "stick to the ship," and to relieve the necessities of those dependent upon them. It was said that this did not lessen the desire of the association to raise money for the Phillips memorial, but rather out of that work would grow the founding of a fund.

In times of danger on shipboard, one man said, the responsibility of the wireless operator is as great as that of the captain. The duty of launching the boats and the actual saving of life or the keeping afloat devolve upon the captain, but the duty of bringing help is that of the man at the key of the wireless instrument. The feeling of some of those who were present at the conference is that there should be some fund out of which to reward the wireless men by the giving of medals or of cash awards. Out of such a fund would also come help for the families of the operators who lose their lives in the performance of duty. The Marconi Wireless Telegraph Co. of America have contributed a sum of 500 dollars.

### The Marconi International Marine Communication Company.

The twelfth ordinary general meeting of the Marconi International Marine Communication Co., Ltd., was held at Marconi House on Wednesday, July 31st.

In the absence of Mr. Marconi, Mr. Godfrey C. Isaacs presided, and in the course of his remarks he referred to the directors' report as, in his opinion, entirely adequate with regard to the information it contained, so that there was not much left for him to enlarge upon. He wished to call attention, however, to the very satisfactory progress of the business. The figures spoke for themselves. Ships' telegrams and traffic subsidies amounted to £64,000 as compared with £40,000 in the preceding year, and there was a marked increase in the number of ships, which was now 406 as compared with 350 on December 31st, 1911, and 250 on December 31st, 1910, while progress was still being made in even greater proportion, so that there was every prospect of a considerable impetus to the business in the near future. No doubt the shareholders had followed to some extent the details which had lately come to light as regards the part played by wireless telegraphy in connection with ships at sea, and were able to appreciate the signs and draw their conclusions as to what was likely to result from the unfortunate "Titanic" disaster. Such results had been foreshadowed by the International Conference (THE MARCONIGRAPH, August, page 158). The unanimous opinion of that Conference was that every nation should adopt a law by which wireless telegraphy for ships at sea should become compulsory, and the delegates who attended the Conference, and who together represented some 42 nations, would on their return place this resolution before their respective Governments. He could assure the shareholders that there was very good reason to believe that in this country such a law would shortly be introduced into Parliament, and that our example would be followed by a great many other nations, if not by all those represented in the International Conference, and such a course would give a great impetus to business both at home and abroad. The report and accounts were then moved and adopted.

Mr. Dalgleish, a shareholder, complimented the directors upon the successful results of the year's trading and upon the progress of the company. He proposed that the remuneration of the directors for the year 1912 should be £1,000, and expressed appreciation of their services.

A dividend of 7 per cent. for the year ending December 31st, 1911, was announced to be paid on August 31st, 1912.

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A credit of 250,000 francs is sought by the French Government for the purpose of encouraging the equipment of French fishing vessels with wireless telegraph apparatus. Each vessel of the kind carrying its own apparatus is to receive a bounty of 2,000 francs besides an allowance for maintenance.

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# The "Titanic" Report and Wireless Messages

ON April 30th the Board of Trade requested that a formal investigation of the circumstances attending the loss of the steamship "Titanic" should be held, and the Court, consisting of Lord Mersey, Wreck Commissioner, assisted by Rear-Admiral S. A. Gough Calthorpe, Captain A. W. Clarke, Commander F. C. A. Lyon, Professor J. H. Biles, and Mr. E. C. Chaston, accordingly commenced to sit on May 2nd. There were thirty-seven public sittings of the Court, at which ninety-seven witnesses were examined. Twenty-six questions were formulated by the Board of Trade, and these appeared to cover all the circumstances to be inquired into. Briefly summarised, they deal with the history of the ship, with the design, construction, size, speed, general equipment, life-saving apparatus, wireless installation, her orders and course, her passengers, her crew, their training, organisation and discipline; they requested an account of the casualty, its cause, and all the means taken for saving life on board ship.

We have already published in the June and July numbers of THE MARCONIGRAPH a summary of the evidence concerning the working of the wireless apparatus and of the transmission of messages, and it is only necessary at this juncture to present an abstract of the Report in so far as it deals with the questions and evidence dealt with in our earlier issues.

It will be recalled that the wireless telegraphic system was worked by the Marconi 5-kw. motor generator. The house for the Marconi instruments was situated on the boat deck close to the bridge. There were four parallel aerial wires extended between the masts, passing to light booms. From the aerials the connecting wires were laid to the instruments in the house. There were two complete sets of apparatus, one for transmitting and one for receiving messages, the former being fixed in a sound-proof chamber in one corner of the wireless house. There was also an independent storage battery and coil in the event of failure of the current supply which came from the ship's dynamos.

The "Titanic" left Southampton on Wednesday, April 10th, and followed the outward Southern track until Sunday, 14th, in the usual way. At 11.40 p.m. on that day she struck an iceberg, and at 2.20 a.m. on the next day she foundered. It was found that several reports of the presence of ice had been received on the bridge of the "Titanic," and we reproduce the most interesting of them, as it contains a reference to a disabled steamer being towed back to Halifax. It was sent from the s.s. "Baltic," and was received by Captain Smith at 1.42 p.m. on the 14th. It read as follows:

> "Captain Smith, 'Titanic,'—Have had moderate variable winds and clear fine weather since leaving. Greek steamer 'Athenia' reports passing icebergs and large quantities of field ice to-day in Lat. 41°51′ N., Long. 49°52′ W. Last night we spoke German oil tank steamer 'Deutschland Stettin' to Philadelphia not under control, short of coal. Lat. 40°42′ N., Long. 55°11′ W. Wishes to be reported New York and other steamers. Wish you and 'Titanic' all success. Commander."

At the time this message was received, the "Titanic" position was about 42°35′ N., 45°50′ W.

There is a graphic account in the Report of the means taken to procure assistance. As soon as the dangerous condition of the ship was realised, messages were sent by the master's orders to all steamers within reach. At 12.15 a.m. the distress signal "C.Q.D." was sent. This was heard by several steamships and by Cape Race. By 12.25 Mr. Boxall, the fourth officer, had worked out the correct position of the "Titanic," and then another message was sent: "Come at once, we have struck a berg." This was heard by the Cunard steamer "Carpathia," which was at this time bound from New York to Liverpool, and 58 miles away. The "Carpathia" answered, saying that she was coming to the assistance of the "Titanic." This was reported to Captain Smith on the boat deck. At 12.26 a message was sent out: "Sinking, cannot hear for noise of steam." Many other messages were also sent, but as they were only heard by steamers which were too far away to render help, the report does not refer to them. At 1.45 a message was heard by the "Carpathia": "Engine room full up to the boilers." The last message sent out was "C.Q.," which was faintly heard by the steamer "Virginia." This message was sent at 2.17. It thus appears that the Marconi apparatus was at work until within a few minutes of the foundering of the "Titanic."

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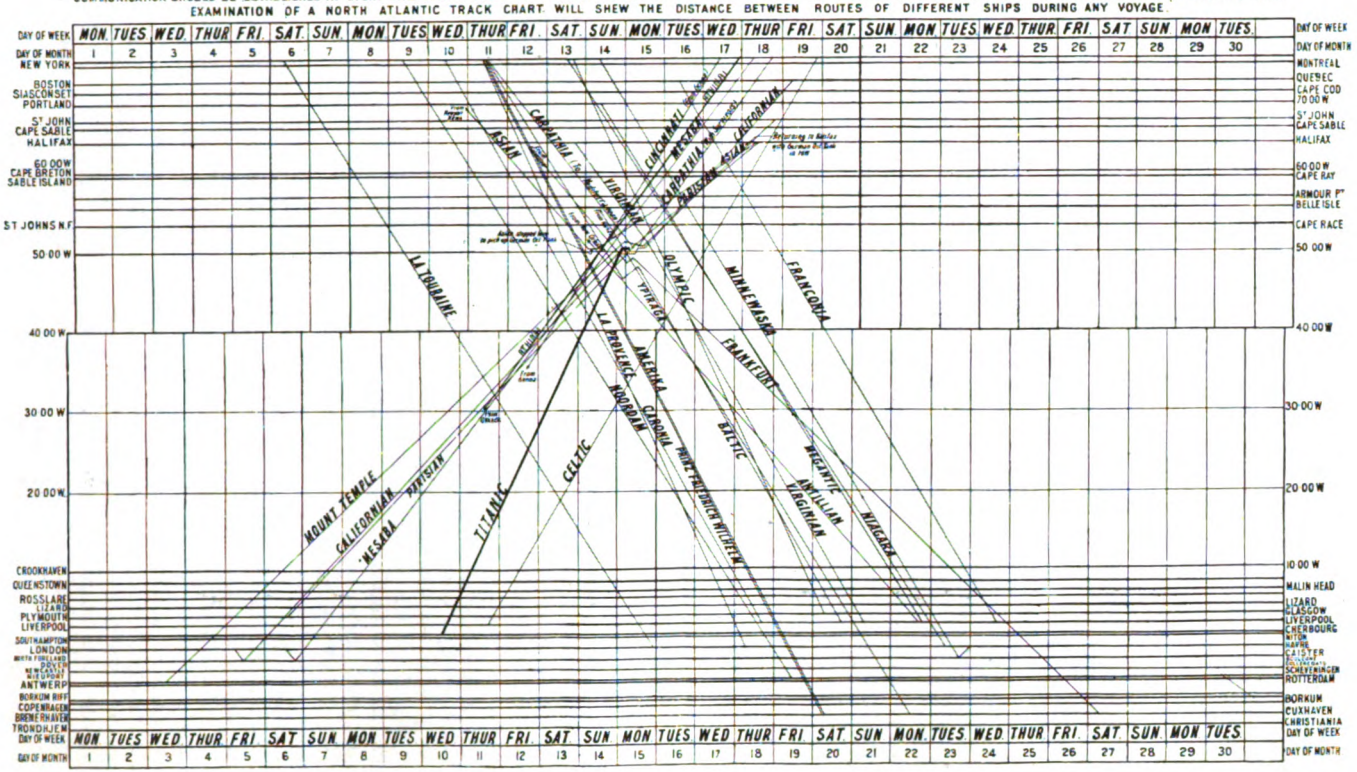
NORTH ATLANTIC

# MARCONI TELEGRAPH.

# COMMUNICATION CHART.

## — APRIL 1912. —

TIME TO BE USED WEST OF 40° LONGITUDE NEW YORK TIME, EAST OF 40° LONGITUDE GREENWICH TIME.
INTERSECTION OF LINES SHEWS EARLIEST TIME SHIPS CAN BE IN SAME LONGITUDE AT BEST AVERAGE SPEEDS
COMMUNICATION SHOULD BE ESTABLISHED AT EVERY INTERSECTION EXCEPT AT CERTAIN POINTS OF THE ROUTE WHEN ONE VESSEL IS ON THE NORTHERN AND THE OTHER ON THE SOUTHERN TRACK
EXAMINATION OF A NORTH ATLANTIC TRACK CHART WILL SHEW THE DISTANCE BETWEEN ROUTES OF DIFFERENT SHIPS DURING ANY VOYAGE.

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The finding of the Court is contained in the answers to the twenty-six questions submitted. Of these only one is of interest here. It was found that the wireless installation was in good and effective working order, and the number of operators (two) was sufficient to enable messages to be received and transmitted continuously by day and night. The Court also found that "there were no erroneous messages." Among the recommendations are that in all ships such as the "Titanic" there should be an installation of wireless telegraphy, that such installation should be worked with a sufficient number of trained operators to secure a continuous service by night and day. Where practicable it was recommended that a silence chamber for receiving messages should form part of the installation.

In connection with the "Titanic" inquiry a special chart was elaborated on the framework of the usual monthly communication chart to show the track of the "Titanic" from the time of her departure up to the position of the collision, and the tracks of all vessels which either sent her ice warnings or heard her distress signals, either direct or through other vessels. From this chart it will be seen how the steamers "Baltic," "Franconia," "Mount Temple," "Californian," etc., altered their course, and how they returned to it afterwards, when it was found they could do nothing, upon instructions from the "Carpathia." The "Baltic" was 243 miles east when she heard the "Titanic's" distress calls, and had steamed back 134 miles before she received advice from the "Carpathia" that she could be of no assistance. The vessel was then instructed to proceed to Liverpool. The line on the accompanying chart denoting the track of the "Carpathia" shows how that vessel spent a few hours on the scene of the disaster taking up the survivors, and then returned to New York. It is interesting to note also the line denoting the track of the "Asian," sailing from Newport News, Liverpool, and how that vessel stopped near the vicinity of the disaster, but on the previous day, to pick up the disabled German oil tank steamer and proceed with the latter in tow to Halifax.

## Life Saving at Sea

THE Merchants' Shipping Advisory Committee, which was formed to look into the matter of the means and regulations necessary for ensuring the safety of life at sea, has now issued its report. In it is included the report of a sub-committee formed to discuss the position of wireless telegraphy in regard to life saving. The gentlemen who served on this sub-committee were: Sir Norman Hill (Chairman), Sir Raymond Beck, Captain G. N. Hampson, Dr. John Inglis, Mr. R. A. Ogilvie, Mr. Henry Radcliffe, Mr. John A. Roxburgh, Mr. F. Shadworth Watts, and Mr. T. Spencer; and they have drawn up an able and interesting report which reviews the position of wireless affairs with clearness, and supports its recommendations with convincing argument.

In the preliminary remarks the committee acknowledge their indebtedness to Commander F. G. Loring, and Mr. J. I. de Wardt, of the Post Office, and to Lieutenant J. A. Slee, of the Admiralty, for the information they were able to afford them. The report then deals with the subject of life saving from a general standpoint, and without making special reference, states that wireless telegraphy has been proved of sufficient value on this score to warrant the State introducing legislation making wireless installations compulsory on such vessels as it may think advisable. These, it suggests in a later section, should certainly include all foreign-going vessels carrying passengers, all foreign-going vessels, British or foreign, carrying passengers from or to the United Kingdom, and having on board 50 persons or more, which number is to include both passengers and crew, and adds that wireless installations would also be advantageous in the case of home trade vessels carrying passengers, but the report points out that it would be inadvisable to make such a recommendation without previous consultation with the Merchants' Shipping Advisory Committee. As regards vessels not carrying passengers, installation would not be absolutely essential, as the law compels all such vessels to carry sufficient boats for life-saving purposes. Nevertheless, the equipment of a certain number using the established trade routes of the world would be likely to prove of assistance in the distribution of distress calls at sea. But the vessels would be unable to recompense themselves for the cost of this installation by the transmission of private messages, and it would only be fair, in the opinion of the committee, to recompense vessels for the cost of installation; if this could not be done, compulsory installation could not be justly applied.

The committee agree with the general principle of this suggestion of its sub-committee, and acknowledge the usefulness of such an installation, but add in their report that the cost of the apparatus could not be defrayed by passengers' messages (there would be little need for such communications), and would therefore be exclusively established for life-saving purposes. Further, the wireless cabin would increase the net measurements of the

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ship, and would augment port dues, which are no inconsiderable item of expenditure, and although the recommendation of compulsory wireless in these two classes of ships is adopted in the report, it was supported by only a small majority of the committee.

The Wireless Telegraph Committee suggest that Parliament should secure the supply of apparatus to merchant vessels at reasonable commercial costs. As regards the range of installation, vessels in the foreign trade should be able to transmit messages over 100 miles of sea by day. In the case of home trade passenger vessels, a considerably smaller range would be sufficient. Ships supplied with compulsory wireless should also have sufficient energy transmitting apparatus, so that current could be supplied capable of effecting transmission for not less than four hours after that supplied by the ship's engines should have failed.

As regards land stations, it is recommended that every possible effort should be made to establish such at points in immediate touch with the ports from which most effective assistance can be sent; that a comprehensive review by the Post Office of their present system of receiving stations should be made, so that a complete and effective change of stations may be arranged; it also points out that all idea of allowing only such installations as can pay their way by the transmission of private messages must be put aside as endangering the completeness of this safety scheme, and the necessary receiving stations must be maintained as a national duty. Unimpeded intercommunication between ship and ship must be made absolutely essential, without regard to the particular system of radiotelegraphy adopted by the two vessels, and adherence to the additional undertaking appended to the radiotelegraphic Convention of 1906 is recommended.

As regards the efficient working of the installations, the committee advises that a permanent watch should be kept. This can be carried out by one fully qualified operator and such assistants as possess sufficient experience to recognise at once a distress or danger signal, but these assistants need not be qualified either to receive or send messages. It recommends further that training ships and schools for the mercantile training should be encouraged to give a preliminary training in wireless telegraphy to the boys under their charge, so that they may be able to assist a skilled operator. Assistance in the case of home-trade vessels would not be required. Finally, the operator should be completely under the control of the captain as regards the transmission of all messages other than those of a private nature.

## Patrolling the Icefield

AN interesting experiment in the way of a tentative patrol of the dangerous icefields in the North Atlantic has been started by Secretary Meyer, who has ordered the American scout cruiser "Birmingham" to proceed to the south of the Grand Banks and report by wireless twice daily the observations of her officers. She will mark out the southern, eastern, and western boundaries of the ice floes and the location of icebergs, and give signals from time to time of the position of icebergs, so that vessels in the vicinity may have warning.

If successful results attend the experiment, it is thought probable that the United States may ask the co-operation of other naval Powers in perfecting a patrol of the icefield. This action by Mr. Meyer is the outcome of a letter sent by the Maritime Association of New York to him, urging the employment of scout cruisers for such a purpose.

Congress has shown evidence of a determination to apply the lessons of the "Titanic" disaster as far as possible. A substitute bill for the measure which was passed by the Senate on April 30th, amending the Act of June 24th, 1910, requiring ocean-going steamers to carry wireless apparatus, was reported to the House recently by Judge Alexander, Chairman of the Merchant Marine Committee. The Senate bill provided that after July 1st next it shall be unlawful for any ocean-going steamer of the United States or any foreign country carrying 100 or more persons, whether passengers or crew, to leave any American port unless the steamer is equipped with efficient apparatus for radio communication in charge of two or more skilled operators, one of whom should be on duty at all hours of the day or night, the apparatus to be capable of transmitting at least 100 miles.

The substitute reported to the House of Representatives postpones until October 1st the date when the Act shall become effective, and it is framed so as to remove any doubt that it shall apply to cargo-carrying vessels by providing that: "It shall be unlawful for any steamer of the United States, as well as passenger vessels of any foreign country navigating the ocean or the Great Lakes, licensed to carry fifty or more passengers or crew, or both, to leave American ports unless equipped as provided in the Act."

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The Spanish Minister of Marine has accepted the tender of the Compañia Nacional de Telegrafia Sin Hilos for supplying a landing station for the Navy, and for the installation of a Marconi set on the cruiser "Princesa de Asturias."

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# Across the Atlantic in a Convict Ship

**By H. J. Gallagher**
(*Marconi Operator on the "Success."*)

THE history of the convict ship "Success" and the description of her equipment which appeared in the May issue of THE MARCONIGRAPH are doubtless too familiar to readers of this magazine to require further reference, as a fitting sequel to that article. But it would be well to give a brief account of the eventful voyage of this old craft across the Atlantic.

I had the questionable privilege of being appointed wireless operator for the journey, and the experiences which resulted were almost as thrilling as any of the records of the sea. To commence with, the wireless cabin was originally the cell of the famous Australian bush-ranger, Henry Parr, and as a residential successor to that notorious gentleman I could feelingly sympathise with him, and even understand why he was driven to bushranging.

The wireless apparatus was practically the same as that supplied for cavalry purposes, and the receiver was the ordinary magnetic detector and tuner. Current was obtained from a small alternator and dynamo direct-coupled to a 2¾-H.P. petrol engine. The latter was placed inside the cabin, with an exhaust pipe through the bulkhead to the deck. The noise can be better imagined than described, and I sometimes wondered whether the spirits of departed desperadoes would lodge an indignant protest against the interruption of their slumbers.

*After 98 days. Awaiting tug outside Boston.*

The crew consisted of thirteen besides the captain, mate and steward. After several ineffective starts we succeeded in leaving Glasson Dock on May 15th, and were towed down the Channel amidst the plaudits of a large concourse of people who had gathered to wish us "God speed." I communicated with Liverpool, and tested both waves satisfactorily. Later in the day I communicated with the "Tunisian," and had some difficulty in making the operator understand who we were. No doubt he imagined himself to be the victim of a practical joke by some facetious individual.

Fastnet was reached two days later, and there the tug signalled us to cast off the towing rope. Our feelings as we watched the disappearance of the tug were far from cheerful, and it was only then that we realised what a hazardous voyage we had embarked upon. We struck a good breeze during the evening, and bowled along at about five knots until the afternoon of the third day, when a sailor reported that the foremast was cracked. An examination revealed the unpleasant fact that it certainly was badly sprung, and as it was impossible to make for New York under the circumstances, we headed towards Queenstown.

Wireless messages were sent *viâ* Crookhaven to the owners of the vessel, and instructions were received from them. Two days later we again made for Fastnet, but a strong south-westerly gale sprang up, and to prevent being wrecked we had once more to steer clear of the shore. The gale lasted three days, and at the end of that time the foremast, on which we could not carry any sail, was almost ready to fall overboard. A second time we got close to Fastnet, and a second time were obliged to beat a hasty retreat. The tug however refused to approach any farther than the head of Kinsale to tow us back, and there we were, with our fore-mast useless, ourselves practically helpless, and already despairing of ever reaching the "old head." Fortunately we before long encountered a fair wind which brought us right up to it, and the tug picked us up and towed us triumphantly into Queenstown Harbour.

The wireless equipment here proved of an

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inestimable benefit. Numerous messages were exchanged every day between the captain and the owners with reference to towage and other

*Mr. Gallagher (Marconi Operator) and Capt. John Smith, in command of the "Success."*

matters, and we were thus able to communicate our position and receive full instructions as to movements.

When we commenced our second attempt we were more fortunate. The weather remained practically dead calm for about two days, and we were afforded an excellent opportunity for studying the geographical position, appearance and surroundings of the Fastnet lighthouse. We were beginning to congratulate ourselves upon having made a successful start, when a westerly gale sprung up and we were blown out of our track. The rolling was so great that I had difficulty when communicating with another ship to hold on and keep myself steady. Sleep was a rare visitor to our phantom ship, and it was not long before it was discovered that to obtain rest and avoid being thrown about the cabin it would be necessary to fix straps from the side of the bed to the roof of the cabin.

Bolts and bars may have been effective in keeping the desperate convicts under control in the earlier history of the ship, but the stout nails and other devices of a later day were found to be totally ineffective for keeping any portable goods in place. One scene, which is not likely to be readily obliterated from my memory, is the pursuit by the captain of a heating stove. My attention was drawn to the "chase" by a terrible noise in the direction of the saloon. Arriving breathlessly at the scene of the commotion I found the captain *en deshabille* vainly endeavouring to recapture the stove, which had cut off its anchorage and was careering about the saloon in a most erratic manner. The stove was almost red-hot, which fact did not add to the comfort of the skipper. Viewed from this distance the incident seems very amusing, but at the time we failed to see the humorous side, for the pursuit of a red-hot stove on an old boat sailing across the angry ocean is not calculated to stimulate a sense of the ridiculous. When about half-way across the Atlantic we came to the conclusion that there was little use on board for such articles as chairs and tables, and often we were obliged to have our meals sitting on the floor. Taking liquid food was more like a juggling exercise, and even while sitting on the floor we were impressed with the old saying that "there's many a slip 'twixt the cup and the lip." The dinner service used on the ship was designed more for use than for ornament, and a highly-polished corned-beef can made a very respectable soup tureen.

Wireless communication was maintained with several steamers every day until June 4th, when we left the track to proceed north for the Newfoundland banks. Several liners passed us four or five times, and soon we became to them a recognised landmark.

On June 1st we were thrown into a state of mild excitement by the appearance on the horizon of a fine steamer which afterwards proved to be the "Oceanic." The sight of this vessel created in us feelings similar to those kindled in a child by a pastrycook's window, and when we were abeam we received a wireless message informing us that we "looked splendid" and "hoping that we were having an enjoyable trip." It was adding insult to injury with a vengeance, and we could only plaintively respond that our looks were very deceptive. The owner of the "Success" was on his way to America on board the "Oceanic," which passed us about two miles off. This was perhaps fortunate, for the expression on the faces of some of the sailors clearly indicated that they would have risked a watery grave in order to obtain liberty had the "Oceanic" come closer.

Before we had quite recovered from the effects of this incident we were disagreeably surprised to learn that the supply of water on board would only last for five weeks, while a period of seven or eight would be the shortest in which to make the journey to port. Economy, then, became the order of the day. The supply allowed to each man for his daily ablutions had never been more than two

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pints, but this had to be immediately cut off, and it was left to occasional showers of rain to supply us with sufficient water for washing purposes. Food was also becoming scarce, butter, coffee and vegetables being looked upon as rare luxuries, and the steward informed us that before long our menu would be confined to salt beef and pork.

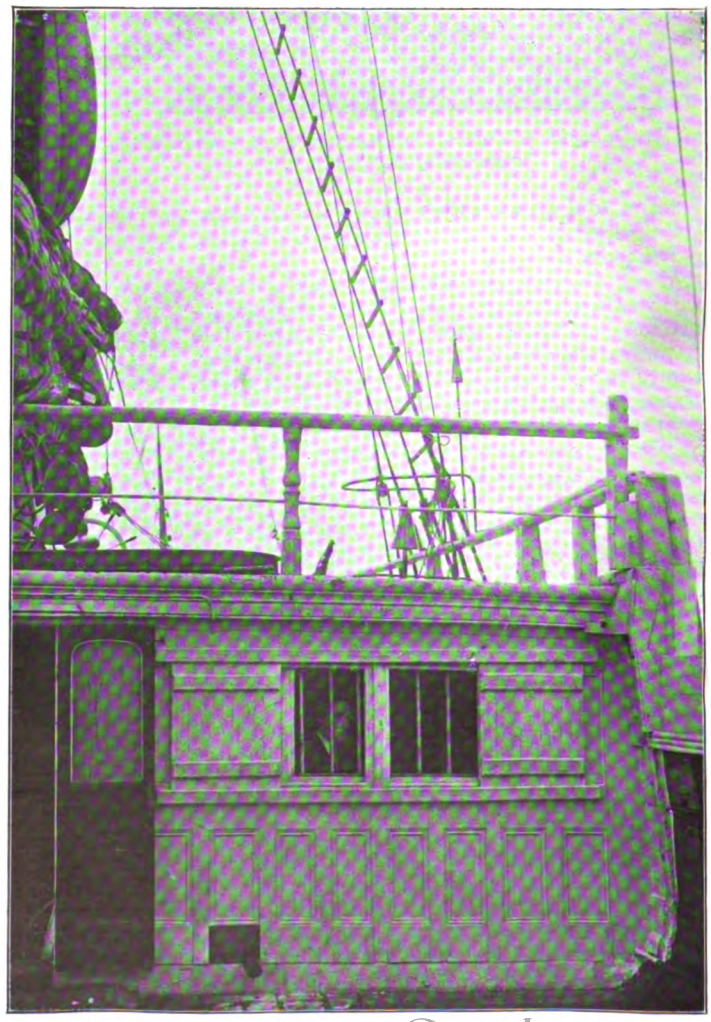
The outlook was not improved by the feeling of unrest which spread among the crew. This culminated on June 5th in an interview with the captain, when a demand was made for better food; and as it was impossible to comply with their request, the crew ceased work. The captain advised the mutineers that they would be severely dealt with on arrival at the port of destination, but the strike continued, and no work was done for two days. At the end of that time the men submitted to the inevitable and once more resumed their duties. On June 15th we were again in the "roaring forties," and experienced a hurricane. Practically all sail was taken down. The mountainous seas looked as though they would crush our helpless little vessel out of existence, and as we were some distance north of the track we were not in wireless communication. During this storm the ship rolled to an angle of 45 degrees.

Our troubles hitherto were practically nothing as compared with those which were to come. Food became so scarce that soon we could be supplied with nothing but scanty portions of salt beef. After seven days' strenuous toil through heavy seas and dense fogs we had only made 60 miles headway, and everyone on board began to despair of ever reaching their destination. Numerous bergs were sighted on our passage through the ice region, and with one of these we nearly collided. At length some relief was afforded by a fishing fleet in the neighbourhood, who supplied us with baskets of fish.

On June 19th we had already been six weeks out at sea and had only covered half the distance; so we established communication with a Glasgow liner, through which we sent several reassuring messages to the owners, and about three weeks later we received a wireless from New York instructing us to make Boston our destination, and we hailed the news with delight, as Boston shortened our journey by 150 miles.

We sighted Cape Ann on the morning of July 17th, and there obtained the service of a tug to complete our journey from Lancaster. It has lasted 98 days, and we were practically on the verge of starvation when we entered port.

The wireless installation worked admirably, and was of inestimable service to us. On two or three occasions during the voyage we were able to obtain correct chronometer times from passing liners, and so we were able to ascertain our correct positions.



*Exterior of an old Cell converted into a Wireless Cabin.*

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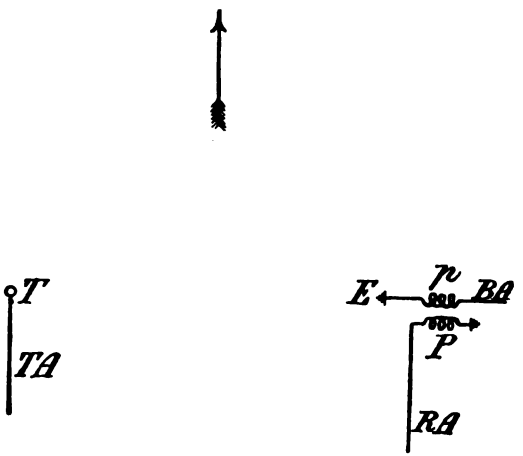
# Simultaneous Reception and Transmission

THE complete specification (No. 13,020, A.D. 1911) has now been published, and a patent granted to Dr. G. Marconi and Marconi's Wireless Telegraph Co., Ltd., which relates to arrangements whereby messages can be simultaneously sent from and received at the same station. According to this invention the transmitting and receiving apparatus of a station are not placed close together, but are placed a short distance apart, such distance being only a small fraction of that over which communication is to take place. The receiving instruments are coupled to two distinct aerials, one of which is used for receiving, and is described as the receiving aerial, while the other (which is known as the balancing aerial) is so arranged that it is practically unaffected by the signals from the distant station with which it is desired to communicate, but that the effect produced through it on the receiver by the adjacent




transmitter is equal and opposite to that produced thereby through the receiving aerial, both the receiving and balancing aerials being tuned to the periodicity of the signals it is desired to receive. This result can be most easily attained by employing horizontal or approximately horizontal aerials as described in Specification No. 14,788 of 1905.

The accompanying drawing is a diagram of a wireless telegraph station arranged in accordance with the invention. T A is the transmitting aerial earthed through the transmitter T and pointing away from the distant station the direction of which is indicated by the arrow; it will thus radiate powerfully in that direction and to a much smaller degree in a direction approximately at right angles in which is situated the receiving apparatus comprising a horizontal aerial R A, which is earthed through the primary P of a receiving transformer, and points away from the distant station so that it may be best affected by oscillations coming from that station, while it is only affected to a small degree by oscillations coming from the direction at right angles.

B A is the balancing aerial earthed at E and pointing away from the transmitter T so that it is best affected by oscillations therefrom, but practically not at all or only to a very small degree by oscillations from the distant station.

In the balancing aerial B A is included a coil *p* which acts as a second primary to the receiving transformer, and is so arranged that the oscillations set up in the aerial B A by the radiation from the transmitting aerial T A produce in the secondary an effect equal and opposite to that produced by the oscillations set up thereby in the aerial R A.

The oscillations, however, from the distant station produce a much greater effect in the aerial R A than in the aerial B A, and will therefore actuate the receiver.

In order that the oscillations produced in R A and B A by the radiation from T A may exactly balance, it is necessary that the phase of the oscillations in R A be the same as that of the oscillations in B A. The relation of these phases depends on the relation of the respective distances of R A and B A from T A, and by moving B A a fraction of a wave length nearer or further from T A the phase can be made exactly to correspond.

If, however, owing to the nature of the ground it be difficult to arrange B A as desired, the phase may be corrected by combining the effect of two or more balancing aerials, or by any well-known method of phase shifting.

The required result may also be attained if one only of the aerials coupled to the receiving instruments be directive, while the other (and it may be also the transmitting aerial) is of the usual vertical type, but in general the more directive aerials are employed the nearer together may the transmitting and receiving apparatus be placed. The transmitter may if desired be operated through an ordinary

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telegraph line from the room containing the receiving instruments, and in this manner it is possible to transmit and to receive simultaneously from the same operating room. If the transmitted and received oscillations be of different wave-lengths, the distance between the transmitting and receiving apparatus may be reduced; the effect of the waves from the transmitting aerial T A is then to impulse these two aerials and to set them oscillating with their own natural frequency, which, however, is not that of these waves. Good results have been obtained with a distance between the receiving and transmitting apparatus equal to 0·4 per cent. of the distance between the stations. The aerials R A and B A may be coupled to the receiving apparatus in various ways besides that described, as, for instance, by direct connection or by an electrostatic coupling. In all cases the length of the balancing aerial, its inductance, capacity, resistance and coupling are so adjusted that the period, phase and damping of the oscillations set up in it and in the receiving aerial by the adjacent transmitter are as nearly as possible the same.

Having now particularly described and ascertained the nature of the said invention, and in what manner the same is to be performed, the following claims are made:

1. At a wireless telegraph station the combination with transmitting apparatus of receiving apparatus removed a short distance from the transmitting apparatus and comprising a receiving aerial and a balancing aerial, the latter being tuned to the same periodicity as the former, and so arranged that it is practically unaffected by the signals to be received, but that the effect produced through it on the receiver by the adjacent transmitter is opposed to the effect produced thereby through the receiving aerial substantially as described.

2. At a wireless telegraph station the combination with transmitting apparatus of receiving apparatus removed a short distance from the transmitting apparatus, and comprising a receiving aerial so arranged that the maximum effect is produced upon it by the signals to be received while the minimum effect is produced upon it by the adjacent transmitter, and a balancing aerial tuned to the same periodicity as the receiving aerial, and so arranged that the minimum effect is produced upon it by the signals to be received, while the maximum effect is produced upon it by the adjacent transmitter, and that the said effects of such transmitter can be effectively opposed in the receiver substantially as described.

3. At a wireless telegraph station covered by Claim 1, operating the transmitter by means of a telegraph line from the receiving room.

4. A wireless telegraph station arranged substantially as described with reference to the drawing.

## Questions and Answers

*We invite our readers to send us questions, preferably on technical problems, that have arisen in actual practice.*

"VERAX."—*Resistance.*—Can you inform me whether the resistance of a coil of wire is the same for high-frequency (h.t.) current as for an oscillatory current?—*Answer.*—The reply to this question is in the negative; the resistance of a wire increases with the frequency. Electric currents of high frequency are confined more or less to the surface of the wire, and do not penetrate very far beneath the surface; and as the resistance of wire is more for non-uniform distribution over its cross-section than it is for uniform distribution, the reason for the increase in resistance will be apparent. It will be seen then that the resistance of a coil of wire for high-frequency currents of, say, about 1,000~ will be considerably less than for oscillation frequencies of, say 1,000,000 or more. Also, when a wire is coiled in the form of a helix, the high-frequency apparent resistance is considerably greater than the high-frequency resistance of a similar wire stretched out straight. This is due to its self-inductive effect.

SPARKS.—*Aerials and Wave-length.*—Given two aerials of same length and material, is the natural wave-length the same when aerial is suspended vertically as when part is vertical and part horizontal?—*Answer.*—No; the horizontal portion of the aerial in juxtaposition with the earth's surface becomes in effect a condenser, the intervening air acting as the dielectric. This increases the capacity of the aerial, in comparison with the vertical form, and therefore its natural wave-length is increased.

L. W. C.—*Wave-length and Frequency.*—Is the wave-length in relation to, or affected by, the frequency; and does the frequency depend upon the amount of capacity and inductance in the circuit?—*Answer.*—Yes—that is to say, both the wave-length and natural frequency depend upon the capacity and inductance in the circuits. Every wave-length has a definite frequency in accordance with the formula $v=\lambda x n$, where $v$=velocity 186,000 miles per second; $n$=frequency of oscillations, and $\lambda$=wave-length in miles. If the frequency be 372,000, the wave-length would be half a mile. The wave-length is determined by the formula $\lambda = 195.56\sqrt{cxl}$, where $\lambda$ is in feet, $c$=capacity in microfarads, and $l$=inductance in centimetres.

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## Fact and Fancy

FALSE and misleading statements often defeat their purpose soon enough, but their persistent repetition is apt to create a feeling of uneasiness in the minds of those who are too far removed from headquarters to be able to regard such statements in their true perspective, or to test the motives of those who gave them currency. The moment it was realised, years ago, that the labours of Mr. Marconi and his assistants would fructify into a great national and commercial asset, there was commenced a fierce onslaught upon the organisation responsible for the development of the enterprise, and of which there has been a recrudescence at the intervals when important developments have been announced. There is far too much interesting and remunerative work to do by those who are responsible for the Marconi Company to attend to unfounded rumours and false and misleading statements. But it is necessary that the large number of inquiries received daily in consequence of these statements should be answered, and the directors therefore issued a circular to the shareholders on August 14th, in which the position was clearly explained. This document is really more than a formal circular to shareholders; it has a far wider interest, for it is important that the public also should be clear in their minds if they are to descry aright the misleading and vague statements which are being disseminated.

It is pointed out in the circular that the Marconi Company have ample funds at their disposal for all purposes, and that there is therefore no need for any increase of capital; indeed, the question has never been even under consideration.

With regard to the Government contract, the directors express their full satisfaction with the statement made in the House of Commons by the Postmaster-General. They believe that the pressure of business at the end of the Session, together with the desire to give every opportunity for information and debate, were alone responsible for deferring the ratification until the reopening of Parliament early in October. The delay of two months in the actual construction of the stations is not of serious importance to the company, and does not affect the continued satisfactory progress and development of its business. It is pointed out that in the last report and balance-sheet, and the chairman's statement at the General Meeting on July 9th last, the Government contract played no part in the results therein recorded.

An important feature of the circular is the assurance that

> *Neither your chairman, Mr. Marconi, nor the directors are in anyway alarmed respecting the new Companies which it is said are to be registered for the purpose of purchasing and working new patents, in respect of all of which they are very fully informed.*

There is perhaps no branch of science which lends itself more to alluring claims until put to a practical test than does wireless telegraphy, and it is not surprising that the success of the Marconi Company, together with the universal development of its business, should suddenly cause to be discovered a number of inventors with "new systems" whose claims might appear attractive to an uninitiated public. tI is well to bear in mind that outside the Marconi Company there is little knowledge and no experience of commercial long-distance wireless telegraphy; and it is prudent to remember that, after possessing the acknowledged system, it took Mr. Marconi and his able staff of engineers many years and some hundreds of thousands of pounds before mastering the exigencies of a continuous commercial service over a long distance.

We do not think that many will be misled by the claim that on occasions signals or messages may have been transmitted and received over long distances with small power, bearing in mind that it is over ten years ago that Mr. Marconi was able, in favourable conditions, to transmit messages across the Atlantic, using only 10 kilowatts; he was then, however, very far from having mastered the difficulties of a commercial service. The following fact also should not be lost sight of: *a "system" of wireless telegraphy consists of all the very many pieces of apparatus which, combined, enable a message to be transmitted and received. Many of these pieces can be varied without in any way affecting the system. A Marconi long-distance installation is covered by over 100 patents; a possible variation of one or more of these, even were it an improvement, is far from constituting either a new or improved system.*

So confident are the directors that for long distance commercial wireless telegraphic service they possess a monopoly in fact, that they attached no importance to the clause in the Government contract which was suggestive in words of a five years' monopoly. They therefore themselves volunteered the elimination of that clause.

New enterprises, should they be created, will pass through the same vicissitudes as have been experienced by the Marconi Company, and in the course of years may or may not survive them. In any case the Marconi Company, with its very large and ever-increasing number of patents, its world-wide organisation, a universally established business, a well-trained and experienced staff, directed by the inventor of, and the world's greatest expert in, wireless telegraphy, possesses a long lead, which the directors have confidence it will be able to fully maintain.

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## Reviews of Books

"WIRELESS TELEGRAPHY FOR AMATEURS," by R. P. Howgrave-Graham, M.I.E.E. New and Revised Edition. (London: Percival Marshall & Co., 2s. net.)

This book, which is described as a "handbook on the principles of radiotelegraphy and the construction and working of apparatus for small stations," is intended for the use of the amateur who wishes to communicate over short distances, and to see what he himself can do to evolve a complete world-system of wireless telegraphy, beginning with experiments on the same scale as those with which Mr. Marconi commenced in 1895. It does not claim to be of any use to the serious worker in wireless telegraphy. It is written in a clear and lucid style, and is free from those flights of imagination and references to the "electric fluid" which so often make works of this kind amusing reading. We are bound to admit, however, that we had hitherto lived in ignorance of the adjective "Marconic," which appears on page 42. Finally, we must offer a word of praise to the author for not supplying the answer to the oft-asked question: "How can I build a wireless telegraph station to tune in with Poldhu, Clifden, and all the big Admiralty stations?" and for issuing a much-needed caution against the infringement of patent rights.

"CHEMISTRY," by Professor W. A. Tilden, D.Sc., F.R.S. (London: J. M. Dent & Sons, Ltd., Scientific Primers, 1s. net.)

The past few years have been characterised by great advances in scientific education, and by an increasing desire on the part of the man in the street for knowledge on scientific subjects. The consequence of this has been the production of a number of elementary science primers written by men who are eminent in the department of science of which they deal, and which, therefore, although elementary, may safely be accepted as being reliable and accurate. These books are of use not only to the average lay reader, but also to scientific and engineering students who wish to have some slight working knowledge of a branch of science other than that in which they have specialised.

The manual of chemistry which we have before us, by Dr. W. A. Tilden, of the Imperial College of Science and Technology, is prepared upon a very careful and well-ordered plan. The early pages of the book are entirely occupied with the description of simple and easy experiments, and when a sufficient number of examples have been given it is shown that these all conform to one definite law, and that although these experiments cannot be regarded as being in themselves sufficient grounds for the statement of that law, all experience leads us to believe that the laws enunciated are true. In this way the laws are very clearly impressed upon the student, and although he is not encouraged to think that he can make a complete experimental investigation of every or even any law, he can feel that he himself has demonstrated the truth of that law. All who are interested in the study of wireless telegraphy need a wide knowledge of the fundamental principles of science, and this work can safely be recommended to give them a clear insight into the elements of chemistry.

"GEOLOGY," by Professor J. W. Gregory, F.R.S. (London: J. M. Dent & Sons, Ltd., Scientific Primers, 1s. net.)

This book is another example of the primers referred to above, and it contains some important geological principles which are often omitted from works of this character. The book is divided into four parts—the early history of the earth, the materials of which the earth is made, physical geology, and historical geology. In this way we are led from an interesting consideration of the material with which the nebula from which the earth is evolved is composed—whether it was a vast cloud of incandescent gas or a swarm of metallic masses—to a consideration of the present materials of the earth's crust, and thence to the processes of rock destruction and rock formation. We have an interesting exposition of the causes of the present physical formation of the earth, and of the processes which day by day and year by year are altering in space.

Those in search of a career for their sons cannot do better than apply to the British School of Telegraphy, at 179 Clapham Road, London, S.W., for a copy of their interesting booklet entitled "The Wireless Operator." This booklet presents in an interesting narrative the advantages which a wireless operator has over his friends employed in other commercial spheres. But it does even more than this, for it explains what the budding operator has to know, with special reference to the training facilities provided at the well-known Clapham school, whose manager, Mr. A. W. Ward, has had over forty years' experience of telegraphy, and who is therefore quite conversant with the growth of the subject over that period of time. It is well to note here that four of the operators who were concerned in regard to the foundering of the "Titanic"—namely, Messrs. Bride, Cottam, Durrant, and Evans (all of whom are now in the Marconi service), were trained at the British School of Telegraphy. In conclusion we would add that the booklet referred to is well produced and excellently illustrated.

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# Maritime Wireless Telegraphy

THE following extract from our shipping contemporary, *Fairplay*, is self-explanatory. It drives home with redoubled force the moral to which we pointed when describing the ½-k.w. wireless equipment for cargo boats:

"The other day, while the effects of the coal strike were diminishing at 'the Islands,' and the prices there still uncertain, a tramp steamer coaled at St. Vincent, having been told, on leaving Bahia Blanca, to coal at Teneriffe after St. Vincent. The owners, however, found out, just before the ship's arrival at St. Vincent, that they could obtain coal at Las Palmas at contract price considerably cheaper than at Teneriffe. They therefore cabled to St. Vincent a code word ordering the ship to Las Palmas. This code

*The s.s. "Nonsuch."*

word was mutilated so that the master could not make it out, and he did not think it worth while to await its repetition. The owners were consequently surprised to receive his sailing cable saying he was bound to Teneriffe, after taking the trouble to order him to Las Palmas. And here comes the point. This tramp steamer happens to be fitted with a wireless installation suitable for a tramp, which, as the ship has no electric light, is worked by a Gardner paraffin oil engine on top of the engineer's house, being thus independent of a possibly flooded stoke hold. Consequently, when the owners received the ship's noon position through one of the Canary Island wireless stations, showing the ship was in touch with this station, they sent her a wireless message to go to Las Palmas instead of Teneriffe. This was immediately acknowledged, the ship duly went to Las Palmas, and the owners were thereby saved some £150 on the cost of the bunker coals. Thus the wireless actually corrected the mistake of the cable in this case. The telegraphic address of the owners is the private house of one of them, and the noon message arrived when he was in bed. Within ten minutes he was asleep again, having despatched the previously-prepared message to the ship by telephone from his bedside. The acknowledgment woke him early next morning."

The vessel referred to in the above paragraph is the s.s. "Nonsuch," which is owned by Messrs. Bowles Bros., of 34 Great St. Helens, London, E.C.

As usual, the vessels fitted with Marconi 1½-k.w. apparatus during the month ended August 20th, or for the equipment of which orders have been received during the same period, cover a variety of classes. The leading passenger lines are well to the fore—the Peninsula & Oriental Steam Navigation Co., Ltd., having placed orders for three vessels—the "Soudan," "Dongola" and "Plassy." Two ships are now being fitted for the same company—viz., the "Nankin" and "Nyanza." The "Braemar Castle" has just been equipped for the Union Castle Mail Steamship Company, who have another vessel, the "Cluny Castle," well under way. The following is a brief list of some of the other vessels now being fitted: "Berwindvale" for the Havana Coal Company, "Oxfordshire" for Messrs. Bibby Bros., "Beacon Grange" for Messrs. Houlder Bros., "Pakeha" for the Shaw, Savill & Albion Company, "Aguila" for Messrs. Yeoward Bros., "Flamenco" for the Pacific Steam Navigation Company, "Chagres" for Messrs. Elders & Fyffes, "Vestris" for Messrs. Lamport & Holt, "Desna" for the Royal Mail Steam Packet Company, "Poleric" for Messrs. Andrew Weir & Company, and "Honorius" for the Houston Steamship Company. The cable ship "Silvertown" has also been equipped for the India Rubber, Gutta Percha & Telegraph Works Company, while Messrs. J. Little & Company have had their "Borderer" equipped with a ½-k.w. and emergency plant. Among vessels for the equipment of which orders have been received are the following: "Canberra" for Messrs. Howard, Smith & Company, 'Evangeline" for the Plant Line, "Dakar"

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and "Mandingo" for Messrs. Elder, Dempster & Company, and "Rohilla" and "Rewa" for the British India Steam Navigation Company. Two troopships will be equipped for the India Office, and two for Messrs. McIlwraith, McEacharn Proprietary Company.

As indicating the growing appreciation by owners of yachts of the advantages of a wireless installation, we may mention that recently the Duke of Bedford's new steam yacht "Sapphire" has been fitted with a Standard Marconi 1½-kw. and emergency apparatus. The Pacific Steam Navigation Company have had two further vessels fitted by the Marconi International Marine Communication Co., Ltd., since the last issue of this journal—namely, the "Galicia" and "Esmeraldas." The Shaw Savill & Albion Company have had their "Rangatira" and "Kia Ora" fitted. The "Manchester City" for the Manchester Liners, Ltd., and "Royston Grange" for the Houlder Line, and the "Hypatia" for Messrs. R. P. Houston & Co., are additions to the vessels equipped with Marconi apparatus owned by these companies respectively. The ss. "Demerara" has been fitted for the Royal Mail Steam Packet Company, and the "Mongolia" for the Western Australian Government. Messrs. J. P. Corry & Company have arranged for the equipment of their "Star of Ireland," and the Union Castle Line for the "Comric Castle." The "Brittania" is the latest of the cable ships equipped with Marconi apparatus which the Eastern Telegraph Company have added to their fleet. Among orders received, mention should be made of that from Messrs. Lagés & Company for the equipment of four vessels—namely, "Itapuhy," "Itagiba," "Itacuera" and "Itassuce."

According to a report which has appeared in the Dutch papers, the directors of the Holland South America Line have received news from one of their ships which again clearly demonstrates the advantages of wireless telegraphy. The commander of the s.s. "Zeelandia" reports that his ship has been able to receive time signals during eight days consecutively from the wireless station on the Eiffel Tower in Paris up to a distance of 2,205 nautical miles, and even two days after passing the Canary Islands, up to 18°43 N. lat. and 23°32. Whereas the morning signal could no longer be heard after having passed Cape Finisterre, the evening signal of 11.45 p.m. Greenwich time was received regularly every day. Only on the ninth day could this signal no longer be received, probably owing to atmospheric disturbances. Where it often happens that chronometers read differently in mid-ocean from their readings in mid-harbour, which is probably due to the vibrations of the ship or the engines, these observations are of the greatest importance to shipping.

The Allan Royal Mail Line has arranged with Marconi's Wireless Telegraph Company to carry two wireless operators on every ship of the Allan fleet.

New official regulations, according to which all German passenger vessels carrying seventy-five or more persons, including the crew, must be equipped with wireless apparatus with a radius of 100 sea miles, will come into force on October 1st.

Mr. H. Samuel stated in reply to a question in the House of Commons that a charge of 5s. was made to cover the cost of a radio-telegram conveying a weather report to a ship as well as the radio-telegram asking for information, and that was below the ordinary rate. Radio-telegrams relating to the position of derelicts and other objects dangerous to navigation were transmitted to ships free of charge from British wireless stations, but he was not prepared to furnish weather reports gratuitously.

It is stated that since the beginning of 1909, that is during a period of over three years, the passengers on no fewer than twenty-two shipwrecked vessels have owed their lives to the fact that the ships were equipped with a wireless telegraph system, and were consequently able to send out messages for assistance.

The "Arlanza" is the latest vessel which the Royal Mail Steam Packet Company have added to their South American service. She is a triple screw vessel, having a combination of reciprocating engines and low-pressure turbine. The "Arlanza" is nearly 600 feet long by 65 feet in breadth, with a gross tonnage of about 15,000 tons. She is a very strongly built ship, with watertight bulkheads and steel tops and double bottom extending the whole length of the vessel. The passenger accommodation is a special feature of this ship. A Marconi standard 1½-kw. ship installation has been supplied. This installation is designed to provide for a working range of 200 nautical miles for water, and for a maximum range considerably exceeding that figure. The installation is arranged to tune in transmission to waves of 300, 430, and 600 metres, and to tune in reception to all waves between 100 and 2,500 metres.

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# The Shaking of a Spear

**By Guy Thorne** *

MR. WORDINGHAM rose from the table in the coffee-room of his hotel in Southampton.

He had made an excellent meal, a somewhat unusually elaborate one indeed, and he walked out of the coffee-room into the hall. Going up to the office window, he asked for his bill.

"Going to leave us, Mr. Wordingham?" said the book-keeper.

"Yes, Miss McLeod," Wordingham answered, "by the afternoon train to town. I shall be busy all the morning, but I'll pack my bag now, and if you'll have it brought down into the hall I'll call for it on my way to the station about 3.30."

"It shall be there," said Miss McLeod, as she affixed a receipt stamp to the bill. "And what's your next move, Mr. Wordingham, if I may ask?"

### The Mystery Man

"Straight up to London this afternoon, some dinner at Paddington, and catch the fast train to Penzance—the Flying Cornishman, you know, marvellous train, a non-stop run to Plymouth!"

"Cornwall!" the book-keeper answered; "a long journey this time, Mr. Wordingham. I spent my holidays in Cornwall once, and enjoyed it very much. But as we drove over all those moors to Land's End, I couldn't help thinking how lonely it must be in winter. I shouldn't care for it at this time of year!"

"No, I suppose not," Mr. Wordingham answered. "But, you see, I have work to do. And loneliness is good for work—sometimes!"

Miss McLeod watched him cross the hall and go to the gate of the lift. He was a man of middle height, clean shaven, and extremely neat and precise in his dress. About five-and-forty years of age, his manners were unusually good, and his deference and pleasantness to women always secured him a welcome. Certainly everyone who knew Mr. Wordingham realised that there was something behind the alert, pleasing face which was not easy to discover. He was not explicit. He always had the air of keeping something very much in reserve.

The second book-keeper, a younger girl than the other, had watched Wordingham with interest. She was a newcomer to the hotel, but already a fast friend of Miss McLeod, from whom she asked a question now.

"Who *is* that gentleman, Amy? What a striking face! You seem to know him quite well!"

Miss McLeod sighed. "He's here every month or so," she said. "He used to live here until just under a year ago—in Southampton, I mean."

"What *is* he, Amy?"

### The Inspector's Romance.

"Didn't you know? But, of course, how could you? Why, he's an electrical inspector of the Wireless Company."

"He's got a look of sadness in his face, all the same," said the younger girl.

Miss McLeod looked at her companion.

"So you noticed that!" she said. "Well, you're sitting in the very chair!"

The young woman jumped up.

"What d'you mean?" she said.

"Sit down again, and I'll tell you. I know the whole thing from first to last. Of course. you won't speak of it. It was this way. I've been here for five years now. I often used to see Mr. Wordingham, of course. Two years ago a new assistant was engaged by the management, subject to my approval. She was a Miss Greening—Molly Greening—prettier than you, my dear, but a little fool such as I hope you will never be. There was no backbone in her whatever, no strength of mind, though she'd little clinging girlish ways which appeal to men—fools that they are, even the best of them!

"John—Mr. Wordingham, I mean," she corrected herself hurriedly, "he fell in love with Molly Greening. He thought she was an angel. He was mad about her. He couldn't see what a cunning little cat she really was. If anyone had told him he wouldn't have believed it."

"And then, Amy?"

### An Elopement

"He married her. Of course, what was certain to happen *did* happen. I could have told him that it would, though, of course, he would never have believed me. Molly was a

* This story originally appeared in *Nash's Magazine*, and is reprinted in slightly abridged form, through the courtesy of the Editor.

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flighty little fool without the brains of a flea. John was a steady, clear-headed man, and a perfect companion for anyone except a little fool like her. What happens? A good-looking young fellow comes along—Groome his name was. He'd just joined the Wireless Telegraph Company. Mr. Wordingham took a liking to the fellow, and had him up to his house a good deal. Groome turns out an ungrateful young scamp. He makes love to Molly, she listens to him, and off they go together!"

"And what happened after that?"

Miss McLeod frowned. Her handsome face became lined and angry.

**"That's the Mystery of it"**

"Why, nothing!" she said. "Just nothing at all! That's the mystery of it. Mr. Wordingham just gave up his house and sold his furniture. He is always travelling, and has no permanent home. He's never divorced her. He never speaks of her—he never even seems to avoid this hotel where she used to be. The man's a mystery to everyone!"

The younger girl rose from her seat. There was no one else in the office nor in the hall beyond.

She put her arm round Miss McLeod's shoulders.

"*You'll* discover the mystery, Amy, dear," she said.

. . . . . .

Mr. Wordingham came downstairs from his bedroom in the hotel carrying a fairly large hand-bag of brown leather.

He walked briskly through the hall, with a kindly nod to Miss McLeod, got into a cab that was waiting for him outside the hotel, and was driven quickly to the docks.

He looked in at the office of the shipping company and found that the great liner "Svetic" was moored out in Southampton Water, but that his arrival was expected, and a steam pinnace was waiting for him in the dock. In a few minutes more the broad-beamed little harbour boat had left the steps and was kicking along through the tideway to where the huge liner towered up like some cathedral of the sea, a great empty city of the deep which in three days would once more be populated by citizens from all parts of the world, and would plough its majestic passage to New York.

Mr. Wordingham went briskly up the side, and the quartermaster, on the upper deck forward, touched his cap.

"Mornin', sir," said the quartermaster. "The purser said you were coming aboard to see to the instruments. I was to give you Mr. Horrock's compliments and regrets, and to say how sorry he was that he had to be ashore this morning, sir. He hoped you'd have had a bit of lunch with him."

Mr. Wordingham nodded pleasantly.

"Oh, that won't matter in the least, quartermaster," he said. "At any rate, give my kind regards to the purser, and say that I quite understand."

"The purser said, sir, after you'd done your inspection, would you lunch in the after saloon? The chief steward has his instructions."

Mr. Wordingham nodded. "Thank you," he said, "and now I will go straight to the telegraph-room."

He cast a professional glance aloft, to what seemed a tiny spider's web of wire, strung from one slim mast to another—the masts mere sticks beside the mighty twin funnels through which railway trains could be driven without ever touching the sides.

And as he saw the almost invisible lace-work of wire, evidence of that modern magic which has annihilated time and space, Mr. Wordingham, paid master of all its secrets, smiled rather strangely to himself.

The telegraph-room amidships was in two divisions, the outer fitted up as a small office with a counter, the inner being the actual instrument room. A young fellow of nineteen or so was in the office, an apprentice who acted as clerk and was learning the mysteries of operating under the regular telegraphists.

He stood up very nervously when the great man entered.

Mr. Wordingham nodded pleasantly.

"Good morning," he said. "Your chief is away, I understand?"

"Yes, sir," the lad answered; "Mr. Groome is in London, but joins the ship to-morrow night."

Mr. Wordingham nodded. He knew very well where Mr. Groome was, but his pleasant, placid face showed no sign.

**"I will go into the Instrument-room"**

"Well," he said, "I will go into the instrument-room. Do not disturb me for half an hour, as I wish to test everything."

He passed behind the counter, opened a small door, and went into the instrument-room, pulling and quietly closing the door behind him.

The room was a mass of coiled wire and strange-looking instruments. Upon one side of a long table at which the operator sat was a great copper drum, and shaped vessels of glass surrounded it. Upon a small slab of mahogany were operating keys.

Mr. Wordingham immediately took off his coat and opened his bag. He took out two

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leather cases, containing shining instruments of steel, delicate screw-drivers, odd-looking pliers, wire cutters with insulated handles covered with india-rubber. And then, with extraordinary care, he lifted out a small mahogany box, about the size of one of those "bridge boxes" made to hold two or three packs of cards. Upon the top of the box, projecting through the lid, were two brass terminals, to which electric wires could be attached.

### Mr. Wordingham at Work

Mr. Wordingham looked at this object with a quiet and satisfied smile, remaining lost in thought for nearly two minutes. Then he went down upon his knees and unlocked a large cupboard in the corner of the room. Here were more masses and coils of wire, and stranger-looking instruments than those upon the table.

With a fine saw, the electrical engineer cut away certain portions of the boarding in a dark corner of the cupboard hidden by festoons of heavy wire covered with black, sticky india-rubber. When he had done this, he took the small box from the table and placed it in an aperture thus made.

The purpose of his next proceeding could only have been guessed at by the non-technical spectator. One or two of the thick wires—cables rather, as thick as the neck of a bottle—were severed dexterously, the outer covering stripped up, the inner rubber sheath pulled back, and the intertwisted strands of copper displayed.

Mr. Wordingham screwed two thin pieces of "flex" to the terminals upon the little box. Then he carried them to the great wires, and dexterously attached them by means of long strips of thin rubber ribbon and some black sticky substance, which he squeezed from a tin tube, very much like the tubes in which toothpaste is sold.

He carried out this work with the most extraordinary deftness and precision; his hands flew hither and thither, carrying out their purpose—whatever it was—unfalteringly. It was obvious that he was a master workman.

When he had made the joins, he replaced the cut pieces of board, tacked them down with fine nails, and rubbed a handful of dust over the marks. Not a soul could have told that the complicated apparatus in the cupboard had been tampered with in any way.

These operations had taken the chief engineer some half-hour. Directly they were finished, he fitted the ear-caps over his head, sat down at the table, and rapped out a message or two, to see that everything was in working order, and himself sent a message to the great station at Land's End, announcing his own arrival there some time during the following morning. He listened for a moment, and then, from far-distant Cornwall, came the answer—everything was ready for his visit of inspection.

That done, Mr. Wordingham put his instruments in his bag, dusted the knees of his trousers, put on his coat again, and went out into the office.

"You are only on duty in the daytime when the ship is at sea, I suppose?" he said pleasantly to the boy.

"That is so, sir," the boy answered. "I applied to take a share of the night duty also, as I am very keen to get on, but Mr. Groome told me that orders had been issued that I was not to do so."

"Quite right, quite right," Mr. Wordingham answered. "Get all the sleep you can. You are young yet for night-work."

Wordingham went to the after-saloon, where an excellent lunch awaited him, to which he did full justice. After a cigarette, a cup of coffee, and a friendly chat with the chief steward, he once again went down the side of the ship, entered the launch, and glided swiftly back to the dock.

### Fast Night-Train to Penzance

He drove at once to his hotel, had his luggage put upon a cab, shook hands with Miss McLeod, and was driven to the station. At nine o'clock he caught the fast night train for Penzance.

. . . . .

On the way down to Penzance, Mr. Wordingham travelled in a first-class carriage. He was a man who was particular about his personal luxuries. He never overdid anything, but he liked things "just so," as the saying is—more particularly now that he had no ties, and no one to spend his income upon except himself.

His only other companion in the carriage was an aged clergyman, who, judging by his costume, held some ecclesiastical rank. Mr. Wordingham was not sufficiently acquainted with the niceties of clerical dress to determine if his companion was a bishop, a dean, or an archbishop, but he noticed the gaitered legs beneath the long travelling coat.

The two men had some short and polite conversation, and then Wordingham composed himself to sleep upon his side of the carriage, noticing as he did so that the old clergyman remained sitting upright, and had taken a book, which looked like a Bible, from his dressing-case, and was reading earnestly in it.

Wordingham sank into sleep as the train rushed away through the night on its tremendous non-stop journey to Plymouth. The roar and rattle merged and fused themselves

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in his brain and became but a pleasant accompaniment to his sleep. How long he had been away upon that mysterious frontier-land between life and death which mortals call sleep he did not know, but suddenly he became aware of a droning monotone rising and falling—a human voice, which broke in upon the deep harmonics of the midnight rush.

It went on and gradually became more patent to his awakening consciousness, until he knew that his companion was reading aloud to himself. With an effort Mr. Wordingham opened his eyes.

### The Clergyman

And in the radiance from the cluster of electric lights in the roof of the luxurious carriage, he saw that the clergyman was holding his Bible from him, and, no doubt unconsciously, reading aloud in a sonorous and vibrating voice.

He heard a few words here and there—"iron as straw . . . slingstones are turned . . . *he laugheth at the shaking of a spear.*"

Something or other in these last words made Mr. Wordingham rise at once from his recumbent position. For a moment or two he stared at his companion opposite with a white face and widely-opened eyes. Then he began to laugh silently, rather horribly some people might have thought, and rubbed his dry hands together.

"'He laugheth at the shaking of a spear,'" he said aloud, dwelling upon the words, tasting them, as it were.

The old clergyman looked up in surprise, and the book fell upon his knees.

"I beg your pardon, sir," he said, "I fear I have awakened you. I have been reading aloud to myself—a bad habit of mine—but I have only been conscious of it just at this moment."

"Not at all, not at all, sir," Wordingham answered. "What were those words that I heard—'he laugheth at the shaking of a spear'?"

The clergyman looked in some surprise.

"Yes," he said—"at the shaking of a spear. The words are from the 41st chapter of the Book of Job."

Mr. Wordingham bowed, asked and obtained permission, and lit a meditative cigarette.

In the cold grey light of dawn the train ran in to Penzance. A carriage awaited him; he was driven to the Union Hotel, and went to bed at once.

Next morning he rose, bathed, put on a different suit, breakfasted, and then descended into the courtyard of the hotel, where the small motor-car from the wireless station was awaiting him. His luggage was stowed in the tonneau; he sat back in his seat, and was driven rapidly away, over the wild moors by St. Buryan, until at length he saw rising in the distance two tall towers of open steel girders, which stand upon the very brink of England where she pushes out her granite foot to meet and spurn the Atlantic.

### At the Western Station

For two days Wordingham established himself at the great Western station and conducted various experiments. On the afternoon of the fourth day, March 26th to be precise, Mr. Wordingham stated that he himself would undertake the principal night shift from 11 until 2. He wished to be left absolutely alone, he said, until he was relieved. This was duly arranged, and Wordingham walked back to the hotel to dinner.

That night the chief engineer did but little justice to the excellent dinner placed before him. Contrary to his usual custom, however, he took a bottle of wine, and, much to the surprise of the woman who waited on him, drank several brandies and sodas as evening went on. At five minutes to ten, just before the official closing time, he lit the stable lantern, which he usually carried when out at night, obtained the key of the front door from the landlord, explaining that he would not be back till long after midnight, and started out to the works.

He had previously filled his flask with brandy.

As he approached the station the huge towers were etched in black against the dark sky, immense and far above, while from their summits went crackling whips of white and amethyst, thin snake-like pennons of fire. Down below came the throbbing of a steam-engine, and the purr and mutter of the great dynamos.

He entered the chief operating room, and carefully locked the door.

### The Forbidden Key

This done, he sat down in front of the operating table, with its rows of keys. One of these keys, at the far end of the row, was tied down to staples in the table by knotted tape, each knot being carefully sealed with Mr. Wordingham's signet ring. Pasted on the table in front of it was a piece of paper bearing these words: "*Experimental Key, not to be used, save by myself. By Order,* S. WORDINGHAM."

Wordingham took a pair of folding-scissors from his pocket and carefully freed the key, which sprang up into its original position. Then he glanced at a clock upon the wall.

It was five minutes to twelve.

His ordinarily impassive face grew very

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white, spasms of pain crossed it, his body shook convulsively. The clock struck twelve.

Now the face hardened until it seemed carved in stone ; the lips were compressed to a thin white line. He took the flask of brandy from the table, and drank a deep draught.

" A year ago to-day," he said ; " a year ago to-day ! " in a high unnatural voice, which quivered with rather ghastly laughter. " The anniversary of my wedding ! And now, Molly is waiting in New York ; pretty Molly, whom I married just a year ago ! She's waiting for the good ship ' Svetic ' to bring her back her lover ! Her dear, handsome Charlie !—well, we'll see."

The man's face was transformed into frozen fury, malign, horrible ; a white wedge of horrid purpose.

Suddenly he began to rap one of the keys.

For nearly three minutes he went on tapping and tapping, wearing a headplate with two large cups covering his ears.

" Q Q Q—Q Q Q ! "

Suddenly his face changed a little. In his ears he heard at last the faint ticks of the answer ; he was in touch with the " Svetic " at last ; he was beginning to shake his spear out over the dark and tossing ocean.

" Land's End station—is that ' Svetic ' ? "

" Yes, I am ' Svetic.' "

" Are you operator Charles Groome ? "

A silence for a moment or two, and then the answer :

" Yes, who are you ? "

" Do you know what night this is ? "

" What do you mean ? Who are you ? "

Tap, tap, tap—" This is the anniversary of the wedding of the woman who was once Molly Wordingham. The woman you stole away from your friend, the woman who is waiting for you in New York, the woman you will never see again."

**" Death "**

. . . A silence of nearly a minute, and then once more in Mr. Wordingham's ears the faint ticking. " Who are you, for God's sake, who are you ? "

" DEATH ! "

Another silence, a much longer one this time, and then the message coming through very hurriedly : " Whoever you are, even if you are Wordingham, this jest is very ill-timed."

" I am Wordingham ; this is the anniversary of my wedding night. *I* am Death also ; Death shaking his spear."

" I laugh at you and your threats. I . . ."

Mr. Wordingham took the cups from his ears, and stood up from the table. Then he took two steps towards the end of it.

For a moment his third finger was poised above the end key which had been marked " Experimental," and then it came down upon it sharply, with a succession of raps continued for forty or fifty seconds.

Then, with a very white face, the man went back to the centre of the table, fixed the cups over his ears again, and for nearly five minutes endeavoured to call up the mail steamer " Svetic."

" Q Q Q—Q Q Q."

At the end of five minutes there was still no answer, and Wordingham once more rose from his seat. He knew why there was no answer to his call. It was all over.

He began to laugh and chuckle to himself, making meaningless noises of gratification. The others found him doing so when they broke into the operating-room at 3 o'clock in the morning.

. . . . .

The accident in the wireless telegraphy operating room of the great liner " Svetic " was never satisfactorily explained to the public. The truth of the matter is only known to a very few.

The officers on duty shortly after midnight on the decks of the liner were terrified to hear a sudden loud explosion amidships, sounding, so those of them who were in the Royal Naval Reserve afterwards stated, exactly like the explosion of a small shell.

The noise was almost immediately located, and it was found by the horror-stricken men who had rushed to the wireless telegraphy room that the place was utterly wrecked. Amid a pile of fused wires, heavy furniture and walls splintered to matchwood, lay the body of Mr. Charles Groome, the chief operator. The corpse was dreadfully mangled, but the face was untouched, and wore an expression of supreme horror which none of those who saw it will ever forget.

It can only be conjectured what occurred, but it seems fairly certain that Charles Groome was the victim of the most diabolically ingenious murder ever planned by a fine and scientific brain.

A chuckling idiot in a public asylum, who was once the well-known engineer S. Wordingham, is never likely to give them any assistance in clearing up the matter. It is, however, conjectured that a small and powerful bomb of fulminate of mercury was exploded by means of the Herzian waves. The exact scientific method by which this was accomplished remains a secret. Many scientists are working on the problem now, for when it is re-discovered, as some day it will be, such an invention may prove of incomparable use in war.

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## Personal

Mr. C. F. Burden, a member of the accountants' staff in the head office, sailed for New York on August 17th in the s.s. "Philadelphia" to take up a position on the staff of the Marconi Wireless Telegraph Company of America. Mr. Burden entered the London office as a junior clerk in the early part of 1907, and proved a most

energetic and competent assistant. Apart from his office labours he was one of the most energetic members of the Marconi Athletic Club, serving on the committee, and taking an active part in the football, cricket and tennis sections. Mr. Burden has also served on various committees and organising concerns.

## Athletics

LONDON.

On Saturday, August 10th, the Marconi Cricket Club played a match with the Catford Excelsior. The visitors batted first, knocking up a total of 43 runs. The Marconi eleven started very badly, and 26 runs were scored at a cost of eight wickets. Defeat seemed inevitable, but Mr. Underhill and Mr. Morton obtained the mastery over the visitors' bowling and knocked off the runs that were necessary to give the club a victory, which they gained with one wicket in hand.

A meeting of the Football section was held at Marconi House on August 19th, Mr. T. E. Hobbs presiding. The principal business was the election of captain and vice-captain for the season 1912-13, and Mr. G. Mason and Mr. W. G. C. Marsh were appointed to the respective posts. It was decided to make a change in the colour of the club's jerseys, and next season the jerseys will be white with pale blue collars and cuffs. The first practice match of the season will take place on September 7th between two teams drawn from the club. The committee are making arrangements for two elevens to be run throughout the season, and it is hoped that members will give the club their full support.

CHELMSFORD.

The Marconi Athletic Club (Chelmsford) have recently entered into occupation of their new club rooms adjoining the works. Mr. Charles Mitchell, the works manager, who is president of the club, performed the opening ceremony. The club is now the proud possessor of a fine large recreation room, billiard room, with full-sized table, reading room, baths, etc., all being free of charge to the club of rent, lighting, and heating. A football section has been formed with two teams, who have entered for the first and second divisions of the North Essex and Chelmsford and District Leagues respectively, the Essex Junior Cup and the Chelmsford Charity Cup (Junior Section). Needless to say the members are very keen on winning the various competitions for which they have entered. A first-rate private ground has been acquired in the Baddow Road, and a subscription list has been opened at the works, to which the departmental heads have responded very generously. Two matches have been arranged with the London Marconi House Club, when right royal tussles are promised.

The Chelmsford United Works Sports were to be held on August 31st. Mr. Mitchell is the president for this year. Over 200 entries were received for these sports, the Marconi Club having furnished no fewer than 65 of these entries, including a team for the tug-of-war. The club only supplied one competitor to the Essex County Sports on July 20th—viz., Mr. T. Wenden, who by no means disgraced himself in obtaining second prize in the 300 Yards Hurdles Championship.

## Movements of Operators

J. R. T. Williams, from the "Potsdam" to the steam yacht "Sapphire."

Edward McKelvey, from the London School to the "Corinthian."

E. C. Rumford, from the "Mount Royal" to the "Corinthian."

E. B. Fitler, from the "Magdalena" to the "Trent."

W. Seddon, from the London School to the "Trent."

P. Foran, from the London School to the "Highland Brae."

R. B. Croft, from the "Gaston" to the "China."

A. Cookson, from the "Marmara" to the "Arawa."

J. B. Salmon, from the London School to the "Aragon."

G. H. Sellars, from the "Hermione" to the "Nankin."

W. H. Sharp, from the "Kenilworth Castle" to the "Omrah."

P. S. Firth, from the "Ballarat" to the "Minnehaha."

J. E. Osborne, from the London School to the "Minnehaha."

W. C. Gadd, from the "Ionian" to the "Grantully Castle."

G. E. Cook, from the "Highland Laddie" to the "German."

R. J. Thompson, from the "Narrung" to the "Sicilian."

J. Edwin Osborne, from the London School to the "Sicilian."

J. M. Simmons, from the "Scotian" to the "Moravian."

J. M. Ridley, from the London School to the "Uranium."

H. Ward, from the "Uranium" to the "Nyanza."

T. Muschamp, from the "Ruapehu" to the "Ruahine."

S. H. Adams, from the "Mesaba" to the "Beacon Grange."

J. J. Breen, to the "Borderer."

F. B. Rushworth, from the "Trent" to the "Mount Royal."

F. F. Rice, from the "Montreal" to the "Scotian."

W. J. Thompson, from the London School to the "Scotian."

A. G. Jacobs, from the London School to the "Oceanic."

A. C. Caldwell, from the "Guelph" to the "Braemar Castle."

S. W. Spicer, from the "Wilcannia" to the "Cluny Castle."

P. H. Hooper, from the London School to the "Gascon."

A. G. Powell, from the "Ascania" to the "Narragansepp."

W. Condon from the "Braemar Castle" to the "Ascania."

A. Pink, from the London School to the "Uranium."

C. E. Barber, from the "Highland Rover" to the "Highland Laddie."

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THE MARCONIGRAPH

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# Wireless Telegraphy in Trinidad

AMONG the latest contracts entered into by Marconi's Wireless Telegraph Company with the Crown Agents for the Colonies is a contract for the establishment of a radiotelegraphic station in Trinidad. The site for this station has not yet been definitely chosen. It is proposed to erect a 5-kw. set which will be capable of transmitting on any wave-length from 600 to 2,000 metres. The station will be capable of actuating acoustic receivers over the full range at 30 words per minute. The range of reception will cover all wave-lengths between 100 and 2,300 metres. The climate of the country is damp, and special attention must therefore be given to the materials used in construction of the apparatus and insulation.

The station will be designed to have a normal working range across open water of 350 nautical miles when communicating with a station similarly equipped with regard to mean height of aerial and the power and efficiency of the plant employed. The aerial will be of the T-shape multiple wire type, suspended between the masts, of which there will be two, each 200 ft. in height, of the tubular lattice-work type.

The generating plant will consist of a motor driving an alternating current generator of 5-kw. output at 500 volts, and a periodicity of 300. Another motor-generator set will be supplied for battery charging. The motor will run off existing alternating current supply mains and the generator will be capable of giving 10 kw. at 110/160 volts. The battery of accumulators will consist of 60 cells, having a capacity of 270 ampère hours at a three hours' discharge rate. The transformer will be of the single-phase closed iron circuit core type, capable of delivering 5 K.V.A. at either 7,000 or 14,000 volts, when supplied with alternating current energy at 500 volts and 300 cycles. In conjunction with the transformer a suitable air-cooled iron-core adjustable low-frequency inductance fitted with a controller switch will be furnished to enable the circuit to be brought into resonance with the alternator frequency.

An independent primary and secondary circuit type jigger will be supplied, the primary being provided with terminals, and an adjustable plug connection to afford a means of rapidly changing the number of turns of the primary winding included in the circuit, while the secondary will be provided with suitable plug sockets for connection at various points with the aerial tuning inductance. A special type of disc discharger will be installed to produce a musical note in transmission.

The disc discharger will be driven off an extension of the alternator shaft, and will consist generally of a rotating disc, of insulating material, carrying a number of metal studs bearing a direct numerical relation to the number of the alternating poles, these studs being caused to rotate at the speed of the motor generator set between stationary adjustable electrodes. The design of the disc will be such as to afford a spark frequency of 600 per second when running at a normal speed, and in correct phase relation to the alternator. Two types of receivers will be supplied, comprising : (*a*) Standard Marconi double-magnetic detector working in conjunction with a multiple tuner, and (*b*) a standard Marconi valve type receiver; the former will have a range of adjustment for wave-lengths of from 100 to 2,500 metres, while the latter will have a range of adjustment enabling it to receive all lengths between 600 and 1,600 metres.

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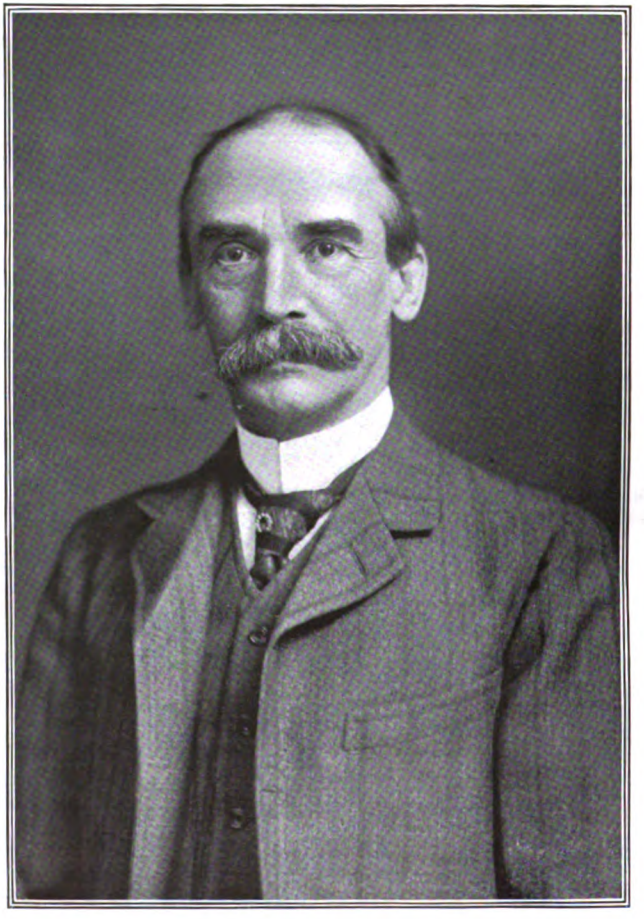

Mr. JOHN BOTTOMLEY

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# Mr. John Bottomley,

## Vice-President of the Marconi Wireless Telegraph Co. of America.

IF Mr. Bottomley, whose portrait appears on the opposite page, had failed to make a mark in the career that he had chosen for himself, it would have caused greater surprise than the fact that he is at the present moment one of the most important business men of New York ; for his mother was Hannah Thomson (sister of William Thomson, afterwards Lord Kelvin), and, if heredity counts for anything, John Bottomley must have derived a large share of his intellectual capacity from his famous uncle.

He was born at Belfast, Ireland, in 1848, a fact which is not without its interest for those followers of Buckle who uphold that external circumstances play a great part in moulding a man, for it is remarkable that many of those who have in after years become the world's most notable men have spent their early life in Ireland, and, in the most impressionable stage of their careers, have been influenced by the spirit and cast of thought which is peculiar to that country.

Moreover, the young Bottomley had the even greater advantage of being educated at private schools in Belfast, where his individuality was less likely to be stamped into that dread matter-of-fact uniformity which is so often the price paid for a public school career, and it was only when he was old enough to look after himself and his opinions that he entered Queen's College. But he was still quite young when he went into business in connection with the largest business house in Ireland on a six years' apprenticeship, and here he made very good use of the opportunities which came his way, for when four years of service were expired his firm waived their right to the remaining two years of his apprenticeship, and placed him in charge of all the departments and establishing agencies throughout Ireland. In 1870 Mr. Bottomley took charge of the flax and grain exporting house of Cummings, a firm that did a large business with Russia and England, and had two important depôts at Riga and London.

Any young man would have had reason to be proud of such achievement, and most would have been content to rest on their merits, but not so John Bottomley. In 1880 he went to America, took up the study of law, and was admitted to the Bar as soon as he had become a naturalised American subject. By so doing he achieved one of his most cherished ambitions, and was able for twenty-five years to practise indefatigably at the profession which he had adopted. It was in 1898 that he first met Mr. Marconi, and took up the very responsible task of introducing wireless telegraphy to the American world of commerce, and when the immense developments of the system required the reorganisation of affairs he became, in 1902, general manager, secretary, and treasurer of the Marconi Wireless Telegraph Co. of America. Since then he has been nominated as second vice-president of the company, which position he holds, in conjunction with many other important offices.

But Mr. Bottomley's interests are too wide to allow of his being entirely absorbed in any one particular occupation. He takes a keen interest in the social work of his city, and often this enables him to use his expert knowledge for the benefit of the community. He is president of the New York Electrical Society, vice-president of the Harlem Library, which is now incorporated with the Public Library, and is vice-president of the Harlem Dispensary, besides being trustee of the Empire Cities Savings Bank and a member of the Finance Committee. He is also a well-known figure at the Engineers and New York Athletic Clubs.

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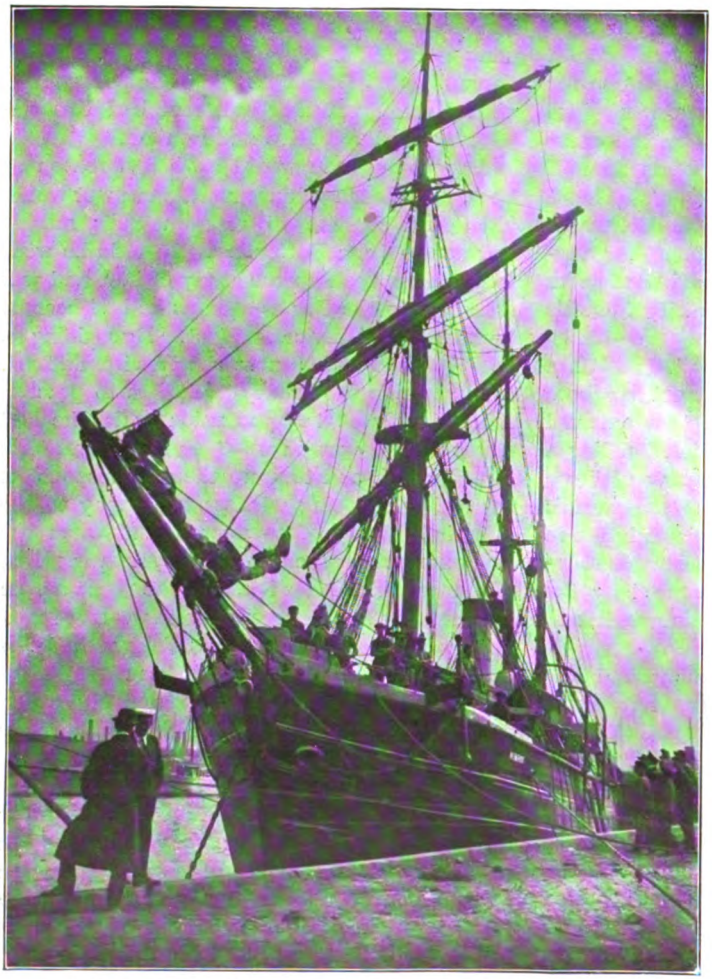
# Wireless to Aid Navigation in the Kara Seas

## Another Tour for the "Nimrod"

THE "Nimrod" was predestined to cold and ice and the wintry terrors of the frozen zone; but she has fulfilled more than her destiny, for under Sir Ernest Shackleton her voyages to the Antarctic have given her a conspicuous place in the rank of Antarctic discovery. With her triumphal return bearing the intrepid little band of explorers her work was not completed, nor was she to fall into the oblivion which generally is the fate of sea-going craft—a fate which overtakes even the gigantic man-of-war.



*The s.s. "Nimrod" prior to her departure for the Kara Seas.*

Now the "Nimrod" is to go to the Arctic Circle, and is to play her part in something more than discovery, for she carries on board the engineers and the apparatus which are ultimately to bring the lonely shores of the Kara Sea into touch with civilisation and the life of the greater world. Wireless stations are to be erected on the coast of North-Western Siberia; one on the island of Vaigats, another at Ugorski-Shar, and a third at Cape Maare-Saale. The two stations at Vaigats and Cape Maare-Saale are small power stations intended for communication with the 12-kw. station at Ugorski-Shar, and this, again, is to communicate directly with a fourth station of 16 kw., which is now being erected at Archangel by the Société Russe de Télégraphes et Téléphones sans fil.

The purpose of the Russian Government in erecting stations at such out-of-the-way places is the establishment of a secure means of communication in order to encourage the existing trade between Archangel and the Yenissei district, and it is expected that at no very future date other stations will be required to cope with an important and increasing trade.

As long back as 1895—that is, before the Trans-Siberian Railway was completed—Captain Wiggins, the celebrated navigator of the Kara Seas, urged that something should be done to make a waterway and open up communications for the conveyance of Siberian exports to the northern ports of Europe. He declared that the as yet incomplete Siberian Railway would make the opening up of such a

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route an urgent necessity, for it would be required to relieve the country of the enormous industry that would be developed in it by the railway. Agriculture would flourish a thousand times more than at that time, for the inhabitants would not be able to consume all they raised. Even at that moment they cultivated ten times more than they had need for, and it was impossible for the railway to carry the cereals to the sea-coast and the Baltic, as there would be sufficient traffic of other descriptions (more particularly passengers, and all the most fragile, costly, and best goods from England, and the urgent demands of tea transport) to monopolise its services. Nor was he alone in his opinion, for he had been able to convince the Russian Government that the scheme demanded immediate attention, and was of paramount importance, so much so that when the Minister of Finance at that time was interviewed on the proposals he is reported to have answered: "It is a serious and important thing for our country; we must open up this sea route immediately, and prove it either a great yes or a great no at once."

But the passing of years only made the necessity for such an enterprise more apparent, and Captain Wiggins, when speaking to the Geographical Society of Melbourne ten years later, after another cruise in the Kara Seas, was able to uphold and confirm his former opinion. Nor did the Government lose sight of the project, but—so complex are the worries of Ministers and so many the cares of the nation—it was impossible to further the scheme. Recently, however, as the result of an expedition which Captain Webster undertook in the "Nimrod" last year to the Kara Sea, a scheme has been provided for the running of ordinary tramp steamers between England and Nova Zembla, on the south-west of which there is a magnificent harbour, and from which goods would be transported to the Ob and Yenisei in vessels specially adapted to resist the ice pressure. It is believed that they would be able to make three voyages each way during the season that navigation is possible, and when the Kara Sea becomes blocked it is suggested that the vessels could be employed in sealing. But another point has to be considered. It is doubtful whether it could ever have become part of a practical policy without the aid of wireless telegraphy, for the dangers of the ice-bound coast are many, and the rigours of the climate retard development. Wireless, however, makes no obeisance to the elements, and can brave the icy blasts of the Arctic Circle. Now, by the erection of these

*Some of the Engineers of the Société Russe de Télégraphs et Téléphones Sans Fil, with Mr. Eisenstein in the centre.*

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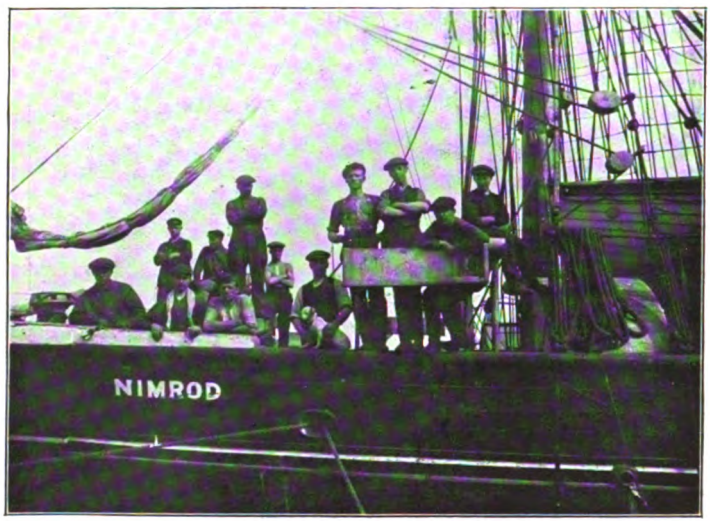
stations, communication will be set up by the port, and timely warning of the opening of the Kara Seas to navigation during the summer months, with regular reports as to the ice conditions prevalent, will be forthcoming.

The floating ice in the Kara Seas forms the chiefest peril. The Duc d'Orleans, who in 1907 undertook a cruise in the Kara Sea, has given some vivid descriptions of this dreary waste of black ice. Here is a characteristic passage :

" These ice floes, which are to be found in the centre of the Kara Seas, come from the coast of Siberia, which is low and sandy. They are formed by shingle and shells which have been covered up by snow. This has melted or been congealed by pressure into a thick mass of ice containing the silt. Again the sun and rains




*A portion of the crew.*

wash away the surface ice, and the *débris* becomes compacted into a horrible black soil. As this travels southward it is gradually broken up and diminished in thickness, until at last the whole of the ice is melted away, and the sediment sinks to the bottom to form the ooze of the Kara Sea. Though the phenomenon may be very interesting from the scientific point of view, from the picturesque standpoint it is deplorable. Nothing could be uglier or more depressing than this stretch of sea covered with heaps of dirty snow, and whenever a passing vessel dents into, or overturns, one of these lumps the sediment spreads out over the surface of the water, giving it a muddy chocolate colour. Often the ice-blocks would collect together in front of us, so that at times we could chase before us a whole bank of mud, and look very much as though we were one of those street-brushing machines which as they revolve send the immondices of big towns into the gutters."

That is not the worst part of the ice difficulty. During the winter the greater part of the Kara Sea is impassable, and winter in these regions lasts a long time. The Ugorski Strait, for instance, is not open till about the middle of July, and ice begins to form again towards the middle of October. In an unfavourable year, however, it may hardly be open at all. A Russian flotilla of cargo boats and lightermen, which were laden with iron and stores for Yenisei, was unable to pass until September 3rd. However, the breaking up of the ice is usually very sudden, and is due to the fresh warm water discharged by rivers which, overrunning the cold sea water, quickly dissolves the ice, and this is characteristic of the coast all along Eastern Siberia.

Imagine a vessel carrying an important cargo being ice-bound for several months together, and it is easy to realise that traders are unwilling to face such risks. Now, however, they will be able to obtain accurate reports of the ice conditions, and their vessels need not sail until a clear passage is assured. By this means risk is brought to a minimum, confidence established, and thus trade develops apace.

The " Nimrod " is just the vessel for the work it has to do and the difficulties it has to encounter, and, considering these circumstances, it is difficult to overestimate the importance of such an expedition as that on which the " Nimrod " is bound. It has been necessary to transfer her to the Russian flag, and she has a crew of 17 men all told. She will carry besides a complement of 16 men, who are to carry out the purpose of the expedition, and who include the necessary engineers and mechanics, as well as a number of workmen who will erect the masts. Those of the two smaller stations will be of the lattice-work pattern, as they are easy of transport, while the masts of the two big stations at Ugorski-Shar and Archangel have, at the request of the Post Office, been specially constructed after the pattern of the Eiffel Tower—that is to say, without stays. The mast at Ugorski-Shar will be 75 metres (about 245 ft.) high, while at Archangel there will be three masts each 70 metres (about 230 ft.) high.

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## A Wireless Girdle Round the Earth

**By F. M. Sammis***

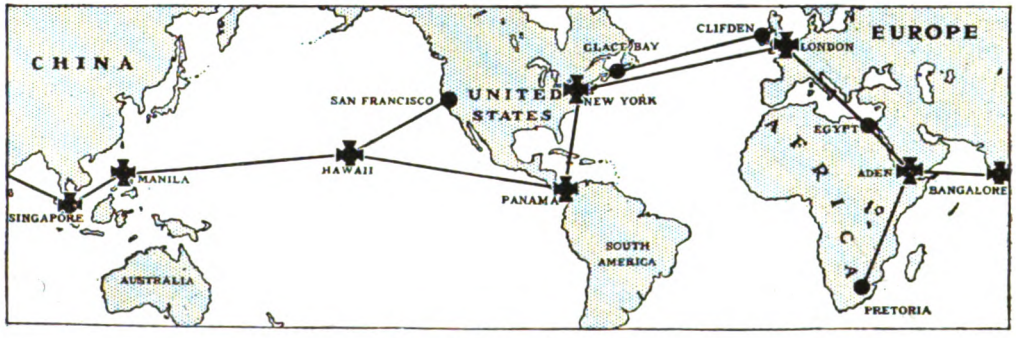
UNTIL the present time our country has not been entitled to boast of a real high-power (wireless) station, but now plans have been finished that will place the United States in the first rank with respect to both size and number of these modern high-power stations, and which, in conjunction with the stations being erected for the English Government, will provide a commercial service that will encompass the earth. This station will be near New York City, at Belmar, N.J., where 500 acres of land have been acquired upon which the masts and plants will be erected. Transmission will be effected to the Panama Canal Zone and thence to Hawaii.

The Hawaiian station will be one of the most powerful of the entire group, for, besides communicating with the station at Panama, it will be capable of working with San Francisco and the Philippine Islands, and with a station to be erected later in New Zealand. The Manila station is the last of the American group, and will connect to the east with the Singapore station of the English group. Unbroken communication will be maintained successively through the stations at Bangalore and Aden. At the latter station we may turn southward over the huge mountains of Abyssinia and the wilds of German East Africa to communicate with Pretoria in South Africa. It is probable that the station at Pretoria will be called upon to communicate with the proposed high-power station at Buenos Ayres soon to be started.

Retracing our steps to Aden on the Red Sea, we may talk with the station in Egypt to the north, and thence, by one tremendous leap, hurl a message with such force that it will cross the wide Mediterranean, ascend the boot of Italy, scale the ice-crowned Alps and drop quietly into London, all in less than one two-thousandth of one minute. Having arrived in England, we may take the present busy route from Clifden, Ireland, to Glace Bay, Nova Scotia, in order to talk with our Canadian neighbour, or we may utilise the new and more powerful station at London. By this means we arrive once more at our starting-point at Belmar. Thus with but nine stepping-stones we may trip around the earth. Still further stations are contemplated; in fact, the chain that girdles the globe will be but the main artery of a great system. Feeders and branch stations will be established in all countries, and a very comprehensive chain will be erected in South America in the near future.

With the establishment of this great network of stations will come an era of cheap communication, for wireless telegraphy may easily reduce the present cable rates. The cost of a submarine cable to cover a distance of 3,000 miles is anywhere from 7,000,000 dollars to 10,000,000 dollars, while the total cost of a pair of wireless stations to do the same work is but 600,000 dollars. The cable must handle a half-million dollars worth of business in order to earn enough to keep it in repair, while 2 per cent. of this amount will take care of the same item for the wireless. Two million words at 25 cents a word will earn only a sufficient sum to cover depreciation of the cable, while the same number of words at half-rate by wireless will produce enough to pay the depreciation charge and 35 per cent. on the investment besides.

The wireless system, in using Nature's ether as a conductor, has provided itself with a medium that requires no repairs. Surely we have here an accommodating servant by means of which we may from a single station talk with nations north, east, south, and west; we need no wires, no cables, no right of way and none of the expensive upkeep or repair that the older forms of communication require




*Large Stations to be erected.*

* Abstracted from an article by the Chief Engineer of the Marconi Wireless Telegraph Co. of America in *Popular Mechanics.*

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# Unsolved Problems of Wireless Telegraphy

## Discussed before the British Association

ONE of the outstanding features of the British Association meetings last month was the joint meeting between sections A and G for the discussion of some of the unsolved problems of wireless telegraphy. From many points of view this discussion was one of the most important features of the Dundee meeting. Contrary to the usual custom, practical achievements were almost disregarded, and there was a total absence of those sensational announcements which have tended to become characteristic of public discussions on wireless telegraphy. The discussion was opened by Professor J. A. Fleming, who, in the all too short time allotted to him for his tale, went directly to the root of the matter, and raised questions which have perplexed physicists and engineers for years. The points discussed were : The " bending " of the waves to follow the contour of the earth, and the so-called " daylight effect," which makes it possible in certain circumstances to transmit signals for a very much greater distance by night than by day, using the same power. In Professor Fleming's opening remarks in the discussion on " Wireless Telegraphy and its Outstanding Problems " he endeavoured to elicit the opinions of mathematicians and others on the reasons why long-distance radiotelegraphy is possible.

The following is a report of Professor Fleming's remarks :

In opening a discussion on the present state of the theory of wireless telegraphy and its outstanding problems, I am to some extent embarrassed by the wide field which presents itself for consideration. I venture to think that we may best take advantage of the simultaneous presence here of physicists, mathematicians, engineers, and electricians if we endeavour to focus attention in the first place on some of the chief scientific problems which are yet unsolved in connection with it.

### Scope of the Inquiry.

Perhaps a word of explanation may be offered on the reason for giving prominence to the scientific aspect of the subject rather than its practical achievements. The achievements loom large in the public eye, and are astonishing, but experts in radiotelegraphy are well aware that many of the scientific phenomena are still imperfectly understood. If we are to overcome present difficulties and limitations, and make fresh advances, it can only be by a thorough comprehension of the physics of wireless telegraphy. Hence it will be more to our advantage to bring combined scientific thought to bear upon the matters on which even leading experts differ or are ignorant, rather than let our symposium resolve itself into a discussion on apparatus or systems, or the recitation of performances and record of results. As the only type of wireless telegraphy which has any considerable theoretical interest at the present time is that involving the application of unguided electromagnetic waves, our attention will doubtless be chiefly directed to it.

Speaking, however, in this place and city, we can hardly forbear to mention the name of that learned and indefatigable philosopher, James Bowman Lindsay, who made Dundee his home for 33 years. Quite independently he re-invented the telegraphic methods by which Morse and Gale in 1842 had sent electric currents across rivers, and he read a Paper to the British Association, at their Aberdeen meeting in 1859, " On the Transmission of Electricity through Water," in which he described his experiments, and even made the bold suggestion of using conduction through sea water to telegraph across the Atlantic. He carried out successful experiments here across the Tay and at Aberdeen across the Dee, but the subsequent development of submarine cable telegraphy caused these early suggestions for a rudimentary form of telegraphy by conduction through water to fade from view.*

Lindsay suggested putting a plate in the sea at Cornwall and another in the sea at Scotland and connecting them by a wire having a battery in circuit. Two other stations were then to be similarly connected on the coast of America, and a receiving instrument to be included in that second circuit.

Neither this nor the later discovered method of utilising the inductive effect of intermittent or alternating currents, which was initiated by Trowbridge, especially developed by Sir William Preece, improved by Sir Oliver Lodge, and used

* *See* B.A. Report, Aberdeen, 1859, p. 13.

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by Rathenau, Stevenson, Edison, and many others, was available for more than small distances, nor did they provide a compact and

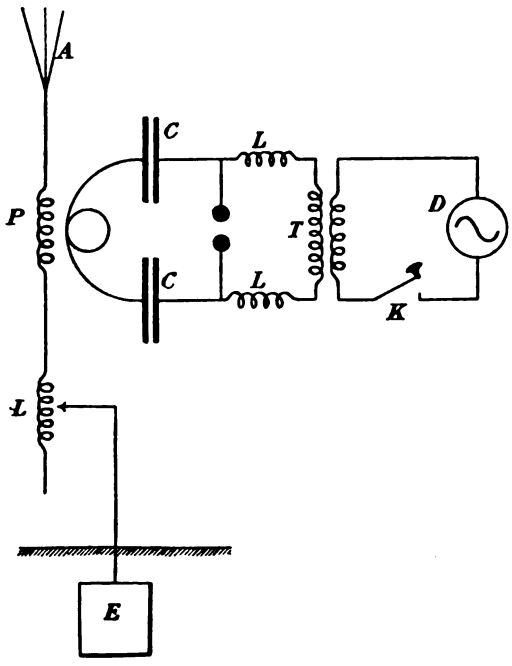


*Fig. 1.*

generally applicable method for effecting communication between ships at sea.*

**The New Era.**

Starting from the discoveries of Hertz and his followers, we enter a new era. Apart from Marconi's improvements in the metallic filings coherer of Hughes, Branly, and Lodge, the important element in the arrangements by which in 1896 he applied purely scientific knowledge of Hertzian electric waves to practical electric wave or radiotelegraphy, was the introduction of the long, nearly vertical aerial wire as a radiator, combined with a metal plate above or buried in the earth as the balancing capacity. In this wire high-frequency oscillations are created ; originally by using the wire itself as one electrode of an air condenser and the earth as the other, but later on by inducing oscillations in the wire by means of the dead-beat or oscillatory discharge in another condenser circuit including a spark-gap coupled to the air wire circuit. Although enormous ingenuity has been expended in improving or varying every element in the appliances, we can say that, with the exception of a small number of stations using the Duddell-Poulsen arc generator, nearly all the practical wireless telegraphy in the world is at present (1912) conducted by the following apparatus, which can be explained with the aid of Figs. 1 and 2 :

At each station there is a transmitter which comprises three elements.

1. A source of high E.M.F. which may be a continuous-current dynamo and storage battery, an alternator (D, Fig. 1) and transformer, or a battery and induction coil giving continuous, alternating or interrupted high-tension E.M.F.

2. A condenser in which the generator stores an electric charge to be suddenly released when a certain potential is attained across a spark-gap in the form of an electric discharge passing through a coil in series with the condenser.

3. An open or radiative circuit coupled to the condenser circuit, comprising an antenna or arrangement of elevated air wires, a balancing capacity or counterpoise often buried in the earth, the two being connected through an adjustable inductance coil.

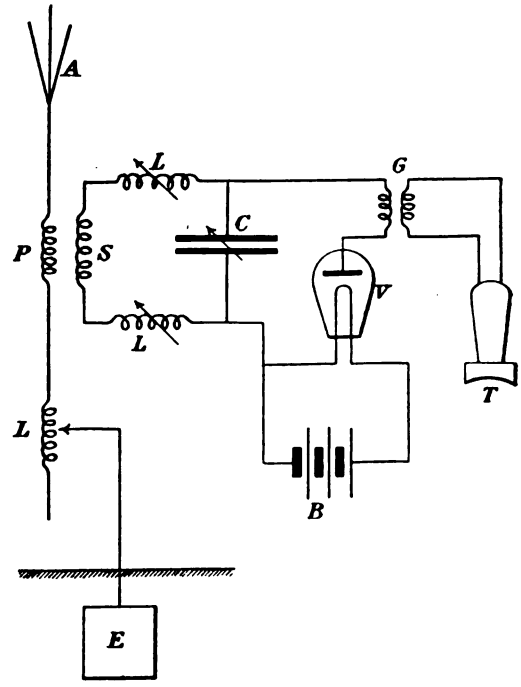


*Fig. 2.*

At the receiving station we have also three elements, as shown in Fig. 2 :

1. An absorbing antenna, by which the

* The inductive method appears, however, to have a future in connection with telegraphic and telephonic communication with moving railway trains, and has recently been revived again under the name of the "Railophone," based on inventions by Mr. von Kramer and Dr. G. Kapp.

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radiation from the transmitter is picked up, creating in it high-frequency oscillations.

2. A condenser circuit having variable capacity and inductance coupled to the antenna and syntonised to it.

3. Some form of oscillation detector connected in series or parallel with the above condenser, which is affected by the oscillations, and sets in operation a recording or indicating device which makes a visible or audible signal.

Generally speaking, at any one station the radiating and absorbing antennæ are one and the same, and used for both purposes alternately, and each station has both transmitting and receiving apparatus. The functions are, however, not identical. What is required in the transmitting antenna is a certain height and also free or insulated ends. In the receiving antenna not only height but surface is required, although this antenna can be laid parallel with and close to the earth, and earthed at both ends; but provided it is half a wave-length in length it will still absorb a considerable amount of energy from electric waves arriving in its own direction.*

In the next place, as to exact details, the following information may be useful to those who are not wireless telegraph engineers:

**The Antenna.**

The antenna consists of a large number of hard-drawn copper wires, which are upheld by masts or towers in such fashion that the wires form a sort of fan elevated in the air; or they may rise up for a certain height and then be bent downward on all sides, like the ribs of an umbrella. In the case of our battleships they are groups of parallel wires kept separate by wooden stars and stretched between the masts and then led downwards to the bow and stern of the ship. In the high-power Marconi stations they rise up vertically for a certain distance and are then stretched horizontally for a distance about five times greater parallel with the ground.

In long-distance stations the wooden or steel lattice towers, or tubular masts, required to sustain these wires are elaborate structures 100 ft. to 400 ft. or more in height, and have to be well stayed to resist wind.

Associated with the antenna is a counterpoise or balancing capacity, which may consist of insulated wires stretched a little way above the earth, or radiating wires or metal nets laid in the earth, or sheets or nets of metal laid on the ground, or even the metal hull of a ship.

This counterpoise is connected to the antenna through a variable inductance coil. In virtue of the capacity of the antenna with respect to the earth or the counterpoise, the whole system has a natural time period of electrical oscillation.

It may be compared with an elastic steel strip held at the bottom in a vice and loaded at the top, which can be set in vibration by small blows administered to it at the proper rate.

There are certain rates of antenna oscillation reserved for certain purposes.

Thus, for ship or coast signalling, antennæ are used having natural time periods of one millionth or one half-millionth of a second, and for large power stations the time period may be as large as one hundred-thousandth or one fifty-thousandth of a second.

**Excitation of Oscillations.**

In nearly all cases these oscillations are excited in the antenna by the intermittent discharge of a condenser. They are, therefore, damped or decadent trains of free oscillations, separated by intervals of silence. The group frequency, as it is called, or number of the trains of oscillations, is now usually 500 to 1,000, since when using the telephone as a receiver the group frequency is preferably that frequency for which the telephone is most sensitive. Each train of oscillations may comprise 30, 50, or 100 oscillations having the antenna frequency. The antenna is, therefore, set in electrical vibration, so that trains of electric currents run up and down it intermittently, say 500 times a second, each train consisting of 50 or more decadent oscillations, whilst each oscillation or single current occupies a time between one fifty-thousandth of a second and one two-millionth of a second for its complete to-and-fro cycle.

These high-frequency currents in the antenna are created by the induction of a nearly dead beat, or else an oscillatory discharge of a condenser. In small installations the condenser is a collection of Leyden jars, or, more conveniently, glass plates coated with thin sheet zinc or tin, the plates being immersed in a metal or stoneware box of oil.

In the case of some high-power stations Mr. Marconi employs large air condensers consisting of sheets of metal hung up on insulators in a room. At Nauen, and at the Eiffel Tower stations, tubular or plate-glass condensers are used.

The condenser is charged by the source of E.M.F. to a high potential and then discharged across a spark-gap with or without oscillations, and this discharge passes through a coil which may be one coil of a two coil transformer, the

* Numerous patents have been taken out for methods of using one antenna at the same time for sending and receiving. The inventions of Mr. Marconi in connection with this matter are both practical and important, and are being carefully developed by him.

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secondary being inserted in the circuit of the antenna, or else a single coil transformer, then called an auto-transformer, may be made to do duty for the two separate coils in the circuits of the antenna and the storage condenser.

**The Spark-Gap.**

An important element is the spark-gap. In early days, when only small powers were employed, this consisted simply of two stationary brass balls. When large power first began to be applied, as at the Poldhu station in 1901, it was soon found that the oscillatory discharge started an electric arc across the balls, which had to be extinguished before the condenser could again become charged. Also the balls became rapidly worn away. To remedy these defects various inventions were introduced. An air blast was applied to the spark-gap to quench the arc.

I devised for the Marconi Company in 1902 a discharger with revolving balls or discs driven by an electric motor, which overcame some of the difficulties, and this type of slowly-rotating disc discharger, using low-frequency sparks, was used for some considerable time at Poldhu.

Later on Mr. Marconi invented his high-speed studded disc discharger, which is far more efficient, and creates a quenched musical spark of the required character. In this discharger a steel disc having studs on it revolves at a high speed between two other revolving electrodes, and the passage of the studs starts a condenser discharge in which any true arc is instantly quenched. The kind of discharge required for effective work is one in which rapidly repeated, strong, highly-damped discharges take place in the primary condenser circuit, and these excite prolonged trains of free oscillations in the antenna. This is only possible if any true arc discharge in the primary circuit is entirely prevented. This is also achieved by the Wien or Telefunken, the Peukert and Von Lepel dischargers, consisting of flat metal plates in close proximity. In these dischargers the discharges succeed each other with great regularity and at the rate of several hundred per second. When the condenser circuit is properly tuned to the antenna circuit, and coupled to it not too strongly (with about 20 per cent. coupling), we have powerful intermittent oscillations set up in the antenna, each group being very feebly damped and of uniform oscillation frequency. These rapidly succeeding groups of oscillations are cut up into groups of groups in accordance with the signals of the Morse alphabet by means of a key placed in some part of the circuit.

**Uninterrupted Oscillations.**

Although nearly all the radiotelegraphy in the world is now conducted by means of these intermittent condenser oscillations, great efforts are being made to perfect suitable high-frequency high-power alternators, producing persistent or uninterrupted oscillations, and the advent of a commercial machine of this kind will no doubt make it a formidable rival to the existing methods.

Deferring for the moment the consideration of what takes place in the space between the sending and receiving antenna, we may complete our description of the receiving apparatus.

In the sending antenna we have very powerful high-frequency currents at the base and high potentials at the free or upper end. Even in small stations the sending antenna current may have a value of 5 to 10 amperes, whilst in large stations the antenna current at the earthed end is 50 to 100 amperes, and large enough to raise to incandescence quite large rods of arc light carbon.

There is, therefore, a considerable expenditure of power in the antenna. A part of this is spent in heating the antenna, but a large proportion is radiated. Nevertheless, the overall efficiency of the usual wireless telegraph transmitter using the ordinary unquenched condenser spark—meaning by that the ratio of power radiated from the antenna to power supplied by the operating dynamo or battery—is at present probably not more than 20 to 25 per cent. in actual practice, though much higher efficiencies, even up to 75 per cent., have been claimed for the quenched spark system. But the evidence for these high efficiencies is somewhat imperfect.

An extremely small fraction of the whole radiated energy is picked up by the receiving antenna. In this latter we have currents created which are measured in microamperes, or at best in fractions of a milliampere. If the receiving antenna is properly tuned to a closed condenser circuit inductively coupled to it, the energy picked up by the receiving antenna accumulates in the associated condenser circuit.

**Detecting Feeble Currents.**

In this last we then have feeble currents circulating which imitate in mode of variation those of the distant transmitting antenna. To detect them it is now most usual to employ a telephone in series with some form of current rectifier, which is shunted across the condenser in the closed secondary receiving circuit, or else some form of current operated detector, such as Marconi's magnetic detector, which is placed in the condenser circuit.

If we merely connect a telephone across the condenser circuit no sound will be produced in it, because the frequency of the current oscillations in the receiving condenser circuit is too

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high to affect a telephone. If, however, we insert some device in series with the telephone which acts like a valve it will rectify the groups of oscillations into prolonged gushes of electricity in one direction, which, coming at the rate of the much lower spark frequency, say about 500 or 1,000 per second, create in the telephone a shrill sound. As these groups are interrupted at the sending station in accordance with the Morse signals, the receiving operator hears long or short musical sounds, which he can interpret into the letters of the alphabet.

Amongst the rectifiers much used, my own oscillation valve, invented in 1904, or glow-lamp detector, is an interesting example. It consists of a little electric glow lamp having a metal plate or cylinder sealed into the glass bulb. When the filament is incandescent the space between the filament and the plate has a unidirectional conductivity, and will allow negative electricity to pass from the filament to the plate, but not in the opposite direction.

Another large class of oscillation rectifiers are the crystal and contact rectifiers, the first of which—viz., carborundum—was discovered by Dunwoody, others by Pierce and Pickard. Thus, for instance, a copper point pressed against a small mass of molybdenite is a good rectifier. Also the minerals chalcopyrite, zincite, bornite, anatase and hessite possess similar properties, and a very sensitive rectifier is made by a slight contact between two small masses of zincite and bornite. Another rectifier is the galena plumbago rectifier. Also a gold point pressed very lightly against an artificial surface of iron pyrites (ferric disulphide) makes an excellent detector.

### Marconi's Magnetic Detector.

In spite of much valuable work done by Prof. G. W. Pierce, G. W. Pickard, and others, the action of these crystal rectifiers is by no means fully elucidated. It appears not to be thermo-electric, since in general the rectified current is in the opposite direction to the thermo-electric current produced by heating the junction.

In addition to these glow-lamp and crystal rectifiers, another much used detector is Marconi's magnetic detector, in which a slowly-moving band of iron wires passes across the poles of a pair of horseshoe magnets. The wire at that place is embraced by two other coils of wire, one in series with the oscillating circuit of the receiver and the other with a telephone. When trains of oscillations are set up in the receiving antenna a listener at the telephone hears a sound due to the sudden change in the magnetic state of the iron. The simplicity and absence of any difficult adjustments make this magnetic detector one of the most useful for general purposes.

The wireless message is thus picked up at the receiving station by hearing telephonic sounds due to a greater or less number of trains of high-frequency oscillations in the transmitting antenna corresponding to *dashes* or *dots* in the Morse alphabet.

These long or short groups of oscillations in the transmitting antenna create similar groups in the receiving antenna, which, when rectified, cause gushes of electricity in one direction through the telephone, and therefore make sounds like ticks or musical notes of long or short duration. The pitch of this note is the frequency of the spark at the sending station.

### A Sensitive *Call* Signal.

One of the practical difficulties not yet quite overcome is the invention of a suitably simple and sensitive *call* signal. At present the operators have to sit with the telephone on their heads waiting for any message which may begin, and this is expert work which cannot be deputed to anyone else.* Another requirement is a simple and yet sensitive relay, by which the messages may be printed down on paper tape. The photographic method, employing the Einthoven galvanometer, is effective but rather elaborate.

The recently-invented alternating-current resonance relay of Dr. Kapp and Mr. H. Von Kramer can be operated with an alternating current having a frequency of about 100 and one-fifth of a milliampere in value. What is required is a relay sensitive to currents of a frequency varying between 50 and 500 or so, and a strength of about one-tenth of a micro-ampere.

Having thus outlined the manner in which the radiotelegraphic message is sent, I now pass on to propound for your discussion certain imperfectly solved scientific questions. The first of these is :

By what mechanism or process are the signals conveyed across the intervening space between the transmitter and the receiver ?

### Hertzian Waves.

Most persons would say at once by electro-magnetic or Hertzian waves, produced in the æther, and the answer is no doubt correct as far as it goes. The action of the sending antenna on the receiving antenna is not merely an instance of one electric current inducing another in a secondary circuit, as in the magnetic induction form of telegraphy. In

* The Marconi Company have recently introduced a call instrument, in which a signal equivalent to a prolonged *dash* on the Morse code deflects a galvanometer, which in turn closes a bell-battery circuit and rings a bell. The difficulty is, however, to prevent atmospheric discharges from making a false call, but render it sensitive only to a pre-arranged signal.

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radiotelegraphy the energy sent out from the sender no doubt departs from it entirely and exists for a time in a medium before it reaches the receiver. The question is, what is that medium? The whole of the actions in the sending antenna by which the distance effect is produced are consistent with the assumption that electromagnetic waves are sent out from it. But are these waves, strictly speaking, Hertzian waves or space waves? What part, if any, does the earth play in the process? Are the very long distances which can be covered by modern radiotelegraphy consistent with the properties of pure Maxwellian or Hertzian waves produced in the æther? These are the first unsettled questions I wish to throw down for discussion. As soon as Transatlantic signals had been received by the means already described physicists began to ask how such waves, if they are true electromagnetic waves, are propagated one-eighth of the way round the earth. Since then Mr. Marconi has achieved the feat of receiving signals in South America from his Clifden station in Ireland at a distance of 6,000 miles. The problem now is to explain how this effect travels one-quarter of the way round the earth. It suggests at once the query, Could it go half-way round? Can wireless signals be received in New Zealand from England, and may we look forward, not merely to Transatlantic or Transpacific, but to transterrestrial wireless telegraphy to the Antipodes as a practical possibility? The answer to these questions is necessarily connected with that to the more general question, How does the sending antenna affect the receiving antenna at any distance? In a year or more, when the Imperial wireless scheme comes into operation, and the long-distance stations are completed, London will speak to Aden, Aden to Bangalore and Pretoria, Bangalore to Singapore, and from thence the step will be easy to Australia and New Zealand. It is possible that we may yet communicate from London direct to Melbourne without the intermediate stations. In text-books and lectures it has been usual, for the sake of simplicity, to treat the problem of radiotelegraphy as if the earth were a perfectly conducting sphere immersed in free æther. A very little practical experience showed wireless telegraphists that the electric condition of the atmosphere greatly affected it, and that the receiving apparatus, so sensitive to waves intelligently sent out from transmitting stations, picked up in addition all manner of vagrant waves set going by atmospheric discharges; also, early attempts at long-distance radiotelegraphy led Marconi to the discovery of the great influence of daylight upon the distance attainable. If, however, we leave out of account for the present these atmospheric and daylight disturbances, to which we shall return presently, we have still to face the fact that the nature of the terrestrial surface between the sending and receiving station affects the result very appreciably.

### Over Land and Sea

Very early in the practical experience of radiotelegraphy it was found that it could be conducted more easily over sea than over land, and more easily over ordinary wet soil than over very dry sandy soil. But apart altogether from this last effect, it has always been felt that there was something surprising in the fact that it is possible to detect electromagnetic waves created at a distance of one-eighth to one-quarter of the way round the world. It has been generally assumed that this was wholly due to an abnormally large diffraction effect. The first question of importance is, then, whether diffraction can occur to an extent sufficient to account for the observed facts? The determining factor as regards diffraction is the ratio of wave-length to the earth's diameter.

In the early attempts at long-distance wireless telegraphy wave-lengths of 2,000 ft. to 3,000 ft. were used, but at the present time wave-lengths from 10,000 ft. to 20,000 ft. are employed, or, say, one-thousandth of the earth's radius.

Consider for one moment an optical analogue. The mean wave-length of visible light is about 1/50000 of an inch. Suppose a luminous point of infinitely small magnitude were placed at the pole on the surface of a smooth sphere ¼ in. in diameter, or about the size of a pea, in a region otherwise not illuminated. This corresponds to the case of electric waves 1,000 metres in wave-length sent out from a radiotelegraphic station on the earth's surface. Would there be any light due to diffraction at the Equator or even at 45° latitude of this small sphere? It is essentially the province of the mathematical physicists to give us a solution of the above question, but the answer would, I think, be in the negative. To make the case comparable with that of the longest electric waves used for terrestrial radiotelegraphy the sphere would have to be only 1 mm. in diameter. The answer is then not quite so obvious.

The first attempt at the problem in the case of radiotelegraphic waves was made by Prof. H. M. Macdonald in 1903 and 1904.

Last year he published another Paper * in the Transactions of the Royal Society on the same subject. In this last Paper a table is

* *See* Prof. H. M. Macdonald "On the Diffraction of Electric Waves Round a Perfectly Reflecting Obstacle," "Trans." Roy. Soc., London, 1910, Vol. CCX., A, p. 113.

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given for waves of two wave-lengths—viz., 0·2 mile and 0·25 mile, showing the ratio of the calculated amplitude of the received oscillations at a point at certain distances measured along a great circle of the earth to the amplitude which would exist if the earth were absent. For the two wave-lengths and for a distance of 651 miles the ratios are respectively 0·06 and 0·07, or, say, 1 : 14. It may be remarked, however, that the wave-length now used at Marconi's Clifden station in Ireland is nearly 4 miles, and that the maximum distance at which signals have been received is 6,000, and not 600 miles. Hence, before Prof. Macdonald's table can be brought into comparison with the latest practice, his wave-lengths must be increased 20 times and his maximum distance 10 times.

**Diffraction of Waves**

In this recent Paper he refers to the previously published 1904 Paper, in which he showed that the effect at a point on a perfectly conducting sphere due to a Hertzian oscillator near its surface was negligible in comparison with the effect which would have been produced at that point if the sphere were removed, when the point is at some distance from the oscillator and the radius of the sphere is large compared with the wave-length.*

The same problem has also been discussed by Prof. H. Poincaré,† whose recent decease we have so greatly to deplore, in a series of interesting lectures and papers. In his latest memoir, "On the Diffraction of Hertzian Waves," in the "Jahrbuch der Drahtlosen Telegraphie" for 1910, p. 445, Prof. Poincaré reaches the conclusion that the amplitude of the oscillations at a point on the earth's surface which is separated from a transmitting station by an angle, $\phi$, measured along a great circle through the stations, is proportional to an exponential function, $\epsilon^{-mw\frac{\phi}{3}}$, where $m$ is some numerical constant and $w$ is a complex quantity, whose real part is proportional to the frequency. This, at any rate, agrees with one result of practical experience—viz., that to effect radiotelegraphy over long distances large wave-lengths are necessary. But it is difficult to extract from his conclusions means to enable us to predict the exact extent to which diffraction really exists for waves 2 to 4 miles in length.

The problem of the bending of electric waves round the earth has also been discussed by Dr. J. W. Nicholson in a series of able and critical Papers.*

The conclusion arrived at by him after considering the work of Macdonald and Poincaré as the result of his own analysis can best be expressed in his own words (*see* "Phil. Mag.," Vol. XIX., pp. 277–278, 1910).

He assumes that an oscillator is placed near the surface of the sphere with its axis radial, and he says: "On the confines of the geometrical shadow, within a cone of small angle, cutting off but a small portion of the terrestrial surface near the oscillator, true diffraction bands are found, arising from terms now important, in which the order and arguments are nearly equal. But within the shadow beyond the extreme generators of the cone the extinction of the waves is very complete." "The harmonics of a high order are found to be so disposed as to neutralise one another in a remarkable way, and the intensity of the diffracted light at a distance of a few thousand miles round the surface sinks to a minute fraction of its value when the sphere is absent. Thus it is improbable that diffraction can explain the effects unassisted by reflection from an ionised layer in the upper atmosphere or by some other cause."

**Mathematical Explanations**

If this result is confirmed for wave-lengths of 4 miles or one-thousandth part of the earth's mean radius, then it will follow that ordinary diffraction is incapable of explaining long-distance radiotelegraphy, and we must look to some other cause. Before discussing the alternative which has been suggested both by Prof. Poincaré and Dr. Nicholson, I should like to draw your attention to an explanation of a quite different nature, due to Prof. A. Sommerfeld, of Münich. Mathematicians who have dealt with the problem under the assumption of a perfectly conducting earth and a Hertzian oscillator entirely disconnected from it, have assumed conditions which do not hold good in practice. Hence the attempt to explain long-distance radiotelegraphy by the aid of diffraction may be a quite unnecessary effort. The actual earth has a crust composed of materials which chiefly owe their conductivity to water. When free from water these materials composing the igneous and sedimentary rocks (apart from metallic veins and oxides and sulphides of heavy metals), such as granite, gneiss, quartz, slate, chalk, and sandstone, are very fairly good insulators. Although sea water is a conductor, it has a dielectric constant (K = 80) very far from infinite. More-

* *See* H. M. Macdonald, "Proc." Roy. Soc., London, Vol. LXXI., A, p. 251, 1903; Vol. LXXII., A, p. 59, 1904. The conclusions in the first Paper were subjected to some criticism by Lord Rayleigh and Prof. Poincaré.

† *See* Prof. H. Poincaré, "La Lumiere Electrique" Vol. IV., 1908, p. 323, December 12th; also "Comptes Rendus," April 29th, 1909 and "Jahrbuch der Drahtlosen Telegraphie," Vol. III., p. 445, 1910.

* *See* Dr. J. Nicholson, "Phil. Mag.," 1910, Vol. XIX., pp. 276, 435, 516, 757.

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over, at no very great depth in the crust the temperature is sufficiently high to exclude the presence of liquid water, and therefore of any conduction due to it.

The numerical values which have been given for the materials composing the earth's crust are only very approximate. Experimentalists have mostly measured the resistance and dielectric constant of dry samples with continuous or direct currents. They have omitted to take account of the fact that non-metallic materials, such as quartz, felspar, mica, slate, etc., increase in conductivity with rise of temperature, and also have a conductivity for alternating currents quite different from that for direct currents.

**Rocky Materials as Insulators.**

In the majority of cases these rocky materials are very good insulators. Thus, dry granite has a dielectric constant about 7 to 8, and a specific resistance which may be as high as 1,000 megohms per centimetre cube, and dry slate has a dielectric constant of about 12 and specific resistance of about 500 megohms per centimetre cube.*

The problem of the propagation of electric waves over the earth's surface involves, therefore, three important factors which greatly influence the result. First the imperfect conductivity and rather high dielectric constant of the earth, making it a semi-dielectric. Secondly, the effects of atmospheric ionisation, natural electrification and sunlight; and thirdly, the earth's curvature. The German mathematical physicists have of late years considered the first of these factors very carefully, and arrived at some interesting results which I will endeavour to epitomise. Prof. A. Sommerfeld published in 1909 a very able Paper on the propagation of the waves in wireless telegraphy over the earth's surface.†

He supposes that a small Hertzian oscillator is placed with axis vertical at the flat boundary surface of two media, each having conductivity $\sigma$, dielectric constant K and permeability $\mu$, and that the bounding surface is plane and indefinite. Taking E as the electric force and H as magnetic force, we have at any point in space the two circuital or Maxwellian equations fulfilled—viz.,

$$K\dot{E}+4\pi\sigma E=c \operatorname{curl} H$$
$$-\mu\dot{H}=c \operatorname{curl} E,$$

where $c=3\times10^{10}$. The quantities E, $\sigma$ and K are measured in electrostatic units and $\mu$ and H in electromagnetic. Hence, if **E** and **H** are both simple harmonic quantities of frequency $n$, varying as the real part of $\epsilon^{-jpt}$, where $p=2\pi n$, and if we write

$$k^2=\mu K\frac{p^2}{c^2}+jp4\pi\sigma\mu,$$

we have $k^2H=\operatorname{curl}^2H,$
$k^2E=\operatorname{curl}^2E.$

If we then take the magnetic force to be the curl of a vector potential Π, and bear in mind that for vector fields with no divergence the operator

$$-\operatorname{curl}^2=\nabla^2=\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}+\frac{\partial^2}{\partial z^2}\right),$$

we see that Π satisfies the differential equation,

$$\nabla^2\Pi+k^2\Pi=0, \quad . \quad . \quad . \quad . \quad . \quad (1)$$

and that $$H=\operatorname{curl}\Pi \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

and $$E=\frac{c}{4\pi\sigma-jpK}\nabla^2\Pi \quad . \quad . \quad . \quad . \quad (3)$$

If $r^2=x^2+y^2+z^2$, then a particular solution of (1) is

$$\Pi=\frac{1}{r}\epsilon^{jkr}.$$

To obtain a solution applicable to the case in question we have to satisfy the boundary conditions.

These conditions are that the horizontal component of the electric force and the vertical component of the magnetic flux or induction must be continuous across the boundary. Taking suffixes 1 and 2 for the air and earth regions, these boundary conditions are

$$\Pi_1=\Pi_2, \quad \frac{\mu_1}{k_1^2}\frac{\partial\Pi_1}{\partial z}=\frac{\mu_2}{k_2^2}\frac{\partial\Pi_2}{\partial z}.$$

Sommerfeld then shows that a solution of equation (1) is

$$\Pi=CJ_0(\lambda r)\epsilon^{\sqrt{\lambda^2-k^2}z},$$

where $r^2=x^2+y^2+z^2$, and $\lambda$ is an arbitrary parameter, and $J_0(\lambda r)$ is a Bessel's function of zeroth degree. By a series of difficult transformations, the validity of which must be tested by our pure mathematicians, Sommerfeld then proves that Π can be expressed as the sum of three quantities P and Q, such that

$$\Pi=P+Q_1+Q_2,$$

where the quantities $Q_1$ and $Q_2$ correspond to space waves (Raumwellen) and P to a surface

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* *See* "Dielektrizitäts Konstante und Leitfahigkeit der Gesteine," by Heinrich Löwy. "Annalen der Physik," Vol. XXXVI., 1911, p. 125, for a number of measurements of the dielectric constants and conductivity of earth's crust materials.

It has been shown recently, in a Paper by the present writer, assisted by Mr. Dyke, that the alternating-current conductivity of insulators is a function of the frequency, and not by any means identical with the direct-current conductivity. *See* "Journal" Inst. Elec. Eng., 1912, "On the Power Factor and Conductivity of Dielectrics for Alternating Electric Currents." In the case of such substance as marble, slate, and probably others the conductivity appears to increase with the frequency up to a certain point and then diminish again.

† "Ueber die Ausbreitung der Wellen in der Drahtlosen Telegraphie." "Annalen der Physik," 1909, Vol. XXVIII., p. 665.

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wave (Oberflächenwellen). If we take the permeability everywhere to be unity, then Sommerfeld shows that

$$P = C\epsilon^{-j\frac{\pi}{4}}\sqrt{\frac{2\pi}{sr}}\epsilon^{jsr\mp\sqrt{s^2-k^2}z},$$

where $s=\sqrt{\frac{k_1^2k_2^2}{k_1^2+k_2^2}}$ and $C=\frac{k_1^2k_2^2}{(k_1^2-k_2^2)\sqrt{k_1^2+k_2^2}}$

Hence, if we write $a=C\epsilon^{-j\frac{\pi}{4}}\sqrt{\frac{2\pi s}{r}}$,

it follows that the components of the magnetic and electric forces at the bounding surface at a distance $x$ are given by

$$H_y = a\epsilon^{jsx-\sqrt{s^2-k^2}z},$$

$$E_x = \mp\frac{jp}{ck^2}a\sqrt{s^2-k^2}\,\epsilon^{jsx\mp\sqrt{s^2-k^2}z},$$

$$E_z = \frac{p}{ck^2}as\,\epsilon^{jsx\mp\sqrt{s^2-k^2}z}.$$

Hence the amplitudes all vary as $1\sqrt{r}$, and the energy, therefore, inversely as $r$.

This shows that this part of the radiation is a surface or cylindrical wave which follows round the surface, and is quite analogous to the electromagnetic waves produced on wires. These waves are the "Oberflächenwellen." They are very rapidly damped in a downward direction.

They are propagated with a velocity V, such that $V=p/s$, and since $s$ is in general a complex quantity, they suffer damping in a horizontal direction or in the direction of propagation.

The other quantities, $Q_1$ and $Q_2$, correspond to space waves (Raumwellen). Sommerfeld shows that

$$Q_1 = \frac{C_1}{r^2}\epsilon^{jk_1r}$$

and

$$Q_2 = \frac{C_2}{r_2}\epsilon^{jk_2r-\sqrt{k_2^2-k_1^2}z}$$

in the upper medium or air.

Hence the amplitudes of the forces derived from this part of the total potential vary inversely as the square of the distance.

It is, of course, not new to suggest that the waves involved in radiotelegraphy resemble electric waves on wires or are surface waves. It was long ago surmised that the sending antenna, the earth and the receiving antenna might be regarded as one single oscillator in which oscillations were set up. This view has been held, amongst others, by A. Blondel, E. Lecher, and F. G. Baily.*

Prof. Baily pointed out in 1903 that the energy of surface waves would decrease only inversely as the distance, and, therefore, at large distances survive when space waves would have vanished. The strict mathematical proof of their possibility has, however, been only lately given.

### Space and Surface Waves

The space waves are subject to diffraction, and are hindered by obstacles. On the other hand, the surface waves pass round and are unhindered, apart from damping, by the curvature of the surface; also, owing to the surface waves decreasing in amplitude less fast with distance, the surface waves survive when the space waves are extinguished. If, then, Sommerfeld's investigation is valid, we need no longer seek for an explanation of such achievements as the detection of electromagnetic waves one-quarter of the way round the earth in any abnormal diffraction. If Sommerfeld is right, diffraction has nothing to do with the matter. The effect at such distances is entirely due to these "Oberflächenwellen," or surface waves, which, like electric waves on wires, are propagated along the surface, no matter what the curvature may be.

There is a certain analogy between these space and surface electric waves, and corresponding effects in the case of earthquakes. From the time of Poisson it has been known that a shock communicated to an elastic solid created in it two waves, one of dilatation and one of distortion, travelling at different speeds through the mass. In 1885 Lord Rayleigh showed that, in addition, there was a surface wave dependent on the fact that the surface can be distorted, and resists distorsion with a different elasticity to that of the interior of the mass.

These effects are recognised by seismologists as represented in the preliminary tremors and main shock in an earthquake.

In this case two kinds of disturbance are found to be propagated through the earth with velocities of 10 km. and 5 km. per second respectively; also another main shock arrives later which moves with a speed of about 3 km. per second. The latter is a surface wave travelling along the surface crust of the earth, and the two former are space waves travelling through the mass.

In the same manner we can say that in wireless telegraphy we are concerned with three waves—one travelling through the air above the earth, the second through the crust of the earth, and the third a surface or cylindrical wave which is confined to a limited region at the boundary of the two dielectrics.

To obtain numerical values we must know the dielectric constant (K) and conductivity $\sigma$ of the earth's crust materials. I find the

* *See* A. Blondel, "Comptes Rendus du Congres de Nantes," 1898; also E. Lecher, "Physik. Zeitschr.," Vol. III., p. 273, 1901; and Prof. F. G. Baily, "Trans." Royal Scottish Society of Arts, February 9th, 1903.

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dielectric constant of dry slate is about 12, and that of ordinary white marble not specially dried is about 8. Most dry rocks, such as granite, have a dielectric constant near 9.

These constants are generally taken to be approximately as follows:

| | | |
|---|---|---|
| Sea water ..... | K=80 | $\sigma=10^{-11}$ E.M. unit. |
| Fresh water ... | K=80 | $\sigma=10^{-14}$ ,, |
| Damp soil ..... | K=20 | $\sigma=5\times10^{-14}$ ,, |
| Dry rocks or soil | K=4 to 8 | $\sigma=10^{-15}$ or less E.M. unit. |

The conductivities are given in C.G.S. electromagnetic units. It is probable that the conductivity of sea water is greater than $10^{-11}$, for this value implies that the resistivity is 100 ohms per centimetre cube. Also the conductivity of many dry rocks is certainly less than $10^{-15}$. Hence the above values are only very rough. It must be remembered that a conductivity reckoned in electromagnetic units has to be multiplied by $9\times10^{20}$ to convert it to electrostatic units.

If we take $\mu=1$, and for air K=1 and $\sigma=0$, it is easy to see that the ratio $k_2^2/k_1^2=K+j2c\lambda\sigma$, where $\sigma$ is the conductivity of the earth in electromagnetic units and $\lambda$ is the wave length.

Also the *numerical distance* $\rho=\frac{k_1^2}{k_2^2}\frac{k_1}{2}r$.*

For air, $k_1=2\pi/\lambda$, and hence we have

$$\rho=\frac{\pi}{\lambda}\frac{r}{K+j2c\lambda\sigma}.$$

Thus, for sea water, K=80, $\sigma=10^{-11}$, and if the wave-length $\lambda=2$ km. and the actual distance $r=2{,}500$ km., we have $\rho=3\frac{1}{10}$.

If $r=10{,}000$ km. and $\lambda=4$ km., we have $\rho=1\frac{1}{10}$.

On the other hand, for dry soil, for which K=4, $\sigma=10^{-15}$ for waves 2 km. in length and $r=2{,}500$ km. we have $\rho=300$.

Hence, when the earth's surface is a good conductor, the *numerical distance* $\rho$ is a small quantity, and when it is a bad conductor $\rho$ is a large quantity.

Now, Sommerfe'd shows that at or near the earth's surface the vector potential $\Pi$ can be expressed in the form

$$\Pi=(u-jv)\,e^{jkr}\frac{1}{r}.$$

The quantity $u$ concerns the space waves and $v$ the surface waves, and he proves that

$$u=1-2a^2+\frac{2\cdot2}{1\cdot3}a^4-\frac{2\cdot2\cdot2}{1\cdot3\cdot5}a^6,\ \&c.,$$

$$v=a\sqrt{\pi}\left(1-a^2+\frac{a^4}{1\cdot2}-\frac{a^6}{1\cdot2\cdot3}+\&c.\right)$$

where

$$ja^2=\rho=\left(\frac{k_1^2}{k_2^2}\frac{k_1^2-k_2^2}{k_2^2}\frac{k_1}{2}\right).$$

When the lower dielectric has a rather large conductivity, as in the case of sea water, the expression for the numerical distance reduces to

$$\rho=\frac{\pi}{2c\sigma\lambda^2}r.$$

Hence we see that an increase in the wave-length $\lambda$ reduces the values of $\rho$ and $a$, and hence the value of $v$.

Sommerfeld has plotted out two curves which represent the variation of $u$ and $v$ with $\rho$, and it is seen from them that for very small "numerical distances" the space waves predominate, for mean values of $\rho$ the surface waves, and for large values of $\rho$ the space waves again.

The conclusion, however, is that for the achievement of long distances in radiotelegraphy waves of long wave-lengths are necessary, as shown by experience.

### Sommerfeld's Investigations

On the other hand, the radiation from the antenna decreases with increasing wave-length. Hence there is probably a certain maximum wave-length which is most effective for signalling over a given distance and surface.

It is suggested, however, that long-distance radiotelegraphy is chiefly effected by means of the surface waves, or "Oberflächenwellen," of Sommerfeld, which fall off in amplitude inversely as the square root of the distance, and are not limited by diffraction, as they follow round the surface. The earth's curvature limits the range of the space waves seriously, but does not so limit the surface waves.

One difficulty in reading Sommerfeld's Paper is that he does not sufficiently translate his mathematical analysis into physical concepts. Hence it is desirable to consider a little in general terms how these surface waves arise.

If we have two media of different dielectric constants in contiguity, and if a line of electric force crosses the boundary, then it is well known that the conditions to be fulfilled are that the tangential component of the electric force on either side of the boundary must be continuous, and also the normal component of the electric displacement or flux must be continuous. This involves a refraction of the line of electric force in crossing the boundary. It is bent away from or towards the normal, and if $K_1$ and $K_2$ are the dielectric constants, and $\theta_1$ and $\theta_2$ the angles the line makes with the normal, then $K_1\cot\theta_1=K_2\cot\theta_2$. The law of refraction of light is $\mu_1\sin\theta_1=\mu_2\sin\theta_2$. Hence, in the case of light, the velocities of the rays in the two media respectively are proportional to the sines of the angles of incidence and refraction. In the case of the electric force the velocities are inversely as the square roots of

* This quantity $\rho$, which Sommerfeld calls the *numerical distance*, is a function of the real distance $r$ and the quantities $k_1$ and $k_2$, which are determined by the nature of the soil.

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the tangents of the angles of incidence and refraction of the lines of electric force. If, then, we consider a Hertzian oscillator which is partly in one medium and partly in another of greater dielectric constant, there will be a distortion at the boundary of the loops of electric force which are thrown off at each oscillation. If the upper medium is air and the lower medium is a material of greater dielectric constant, then, corresponding to a normal semi-loop of electric force in air, there will be a completing semi-loop in the other material which is sheared backward, as shown

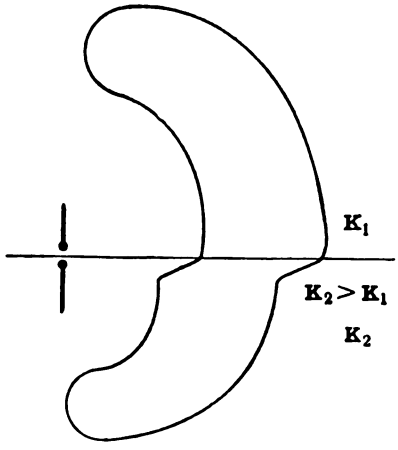


*Fig. 3.*

in Fig. 3. If in the air at the boundary surface the force is normal to the surface, it will not be normal just below that surface in the medium of greater dielectric constant. It will have a longitudinal component. As the oscillations take place these longitudinal components of the force are periodic in space and time, and constitute the surface wave which is similar to the electric waves produced on wires.

### The Earth as a Conductor

If the earth were a perfect conductor, say a ball of copper, at the absolute zero of temperature, these surface waves would be confined merely to the surface skin. In the case of the actual earth, even sea water is a sufficiently poor conductor to allow the penetration of the surface wave to some little depth in it. Although the "numerical distance" is small, it is not so small as to extinguish altogether the surface wave.

The objection has been raised that no experimental proof has been given of the actual existence of Sommerfeld's surface waves. Against this it should be noted that Sommerfeld has carefully explained that the surface waves are not separated sharply from the space waves, and may be regarded merely as a particular distribution of the moving electrostatic field near the common surface of the air and earth and accompanying electric currents in the earth. It is easy to prove that we can have surface electromagnetic waves on a *sheet*, similar in nature to electromagnetic surface waves on wires, of the existence of which we have abundant experimental proof. An argument in favour of the existence of these surface waves may perhaps be derived from the experience that high antennæ do not seem necessary for the *reception* of signals even over long distances, thus indicating that there is a concentrated electric and magnetic field near the surface of the earth.

P. Epstein has delineated from Sommerfeld's equations a portion of the field of electrostatic force round an oscillator placed, first, over a perfectly conducting earth, and, secondly, over an earth of finite conductivity.* In the first case the loops of lines of electrostatic force are seen to terminate perpendicularly on the earth, and are divided symmetrically by the surface plane. In the second case they are distorted, so that the lines at spaced intervals do not terminate perpendicularly. If, however, they have a component parallel to the earth's surface, this is equivalent to a combination with a true space or Hertzian wave of a surface wave similar to the electric waves on wires, which latter can travel along the guiding surface irrespective of curvature of that surface.

### Surface Waves and Distance

If these conclusions are valid, there is nothing to prevent the surface waves going half round the earth. It may, therefore, be quite possible to communicate by radiotelegraphy direct from England to New Zealand. There is one matter which may be of importance. Since the surface waves started from any one point reach an antipodal point by different paths, it may be that, unless the position of the receiving station is rightly selected, interference will arise between surface waves reaching it by different lengths of path, and hence extinction of signals for some places but not others in the same region. According to this theory, then, we need not endeavour to explain long-distance radiotelegraphy by diffraction, because true space waves are very little concerned with it.

* *See* P. Epstein, "Kraftlinien diagramme für die Ausbreitung der Wellen in der drahtlosen Telegraphie bei Berucksichtigung der Bodenbeschaffenheit," "Jahrbuch der Drahtlosen Telegraphie," Vol. IV., p. 176, 1910. Epstein has, however, only delineated the field in the air. He ought to have indicated the nature of the field just below the surface in the sea or earth as well as to show the refraction of the lines of force at the surface.

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We pass on, then, to consider the next question—viz., the influence of the nature of the surface in radiotelegraphy. Why, for instance, it is conducted with certain wavelengths so much more readily over sea than over land ?

This matter has been particularly considered by Dr. Zenneck in an interesting Paper. Assuming, for the sake of simplicity, a plane earth and plane electromagnetic waves, he discusses the effect of the conductivity and dielectric constant of the earth's crust on the wave propagation.* Starting from the same equations as Sommerfeld, he arrives at an expression which enables him to calculate the damping of the waves along the horizontal boundary surface. He shows that this damping is determined by the dielectric constant and conductivity of the earth's crust. He calculates the distance the plane wave must travel before its amplitude is reduced to $1\epsilon$ of that at the transmitter, and exhibits the results for various values of the dielectric constant and conductivity in the form of curves. Waves 1,000 ft. in length over a sea surface would travel 10,000 km. before reduction to $1\epsilon$ in amplitude, but over very dry soil only for 10 km. or less. The analysis shows that there is a considerable penetration of the wave into dry soil, but into so good a conductor as sea water the penetration is at most a metre or two. Moreover, Zenneck shows that over sea surface the lines of electrostatic force terminate nearly perpendicularly to it, but over a dry surface this is not the case. There is, then, a considerable rotating component, and the direction of the electric force is represented by the rotating radius vector of a semi-ellipse, the major axis of which slopes forward in the direction in which the wave is travelling. Zenneck's results have been extended by F. Hack, who has shown that underground moisture has the same effect as surface moisture in preventing degradation of amplitude.

### Theory and Practice

The general result of these investigations compared with practical experience is to show that we can by no means consider the earth to be a perfect conductor in the case of radiotelegraphy, but that it has an extremely influential action in degrading the amplitude of the waves, deforming the travelling electrostatic field and in creating a type of surface wave which attenuates much less fast than a pure Hertzian wave, and can travel round the curvature of the earth quite easily.

On the whole, we may say that the theory as given by Zenneck and Sommerfeld is a valuable attempt to bridge over a very serious gap in our knowledge of the reasons for certain well-ascertained facts in radiotelegraphy. Nevertheless, there are still unexplained difficulties.

Another unsolved problem in radiotelegraphy is the explanation of the effects of the atmospheric conditions and daylight upon it.

The suggested explanations are in many respects imperfect. In the earliest days of radiotelegraphy it was found that atmospheric electric discharges produced irregular and false signals which sometimes greatly interfered with working. These were more objectionable at the time when the receiving instrument was a coherer of some kind associated with the Morse printer. Nowadays, when the reception is by telephone, it is usual to have the spark frequency at the sender high enough to give a shrill note in the telephone. The receiving operator can then distinguish to a great extent between the clear musical note of the right signals and the lower squeaks or grunts in the telephone due to atmospheric discharges. Nevertheless, at certain times and in certain regions the so-called atmospherics present serious obstacles to radiotelegraphic communication.

### Effect of Sunlight

When we turn to the effect of sunlight on the propagation of radiotelegraphic waves, which was discovered and described by Mr. Marconi in 1902,* we find that even after ten years we are still, intellectually speaking, very much in the dark as to the reason for this daylight effect.

The first observation made by him in 1902 was that, by night, signals could be received over sea from the Poldhu station at a distance of 2,099 miles, whereas by day the same kind and type of signal ceased to be detectable at about 700 miles. Also that at the time when the sun rose over the sending station the signals at 700 miles distance quite quickly became very weak.

Of recent years he has noticed that in the morning or evening, when the boundary between light and darkness occurs about halfway across the Atlantic, signals sent across become very weak.

Also he has noticed that, in sending with a

* J. Zenneck, "Ueber die Fortpflanzung ebener Elektromagnetischer Wellen langs ebenen Leiterflache und ihre Beziehung zur drahtlosen Telegraphie," "Ann. der Physik," Vol. XXIII., p. 846, 1907. This Paper was freely translated, with expository notes, by J. A. Fleming, entitled "The Function of the Earth in Radiotelegraphy," *see* "Engineering," June 4th and 11th, 1909.

* *See* G. Marconi, "Proc." Roy. Soc., Lond., June 12th, 1902. "A Note on the Effect of Daylight upon the Propagation of Electromagnetic Influences over Long Distances."

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coupled transmitter radiating waves of two wave-lengths, whereas the longer wave-length is the one generally received, there are certain periods at sunrise and sunset when the shorter wave gives the best signals.

It has also been pointed out both by Mr. Marconi and G. W. Pickard that, soon after the time of sunrise at the sending station, there is a very pronounced decrease in the strength of the signals received a few hundred miles or at some considerable distance from a power station, but that after sunrise there is a partial recovery of strength. There is also a gradual rise in the strength of the signals soon after sunset, and a very pronounced maximum value after or about midnight. An interesting curve

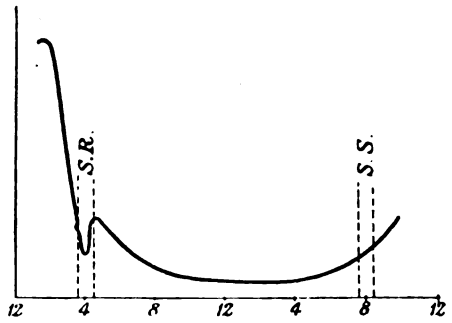


*Fig. 4.*

(Fig. 4) has been given by Prof. Pierce, in his book on "Wireless Telegraphy," p. 135, taken from Pickard's observations, showing the general variation of the strength of received signals at a distance of 600 miles from the Marconi station at Glace Bay during the hours of the day and night. It appears that the current in the receiving telephone at midnight was about 30 times greater than by day.

### Mr. Marconi's Theories

Two theories have so far been proposed to explain this effect:

1. The original suggestion of Mr. Marconi (which has been tentatively adopted by Prof. Zenneck) was that it is due to the effect of light in discharging the sending antenna, so that it does not reach at each oscillation such a high potential by day as in darkness.

2. The theory that the daylight effect is due to the ionisation of the air by sunlight, giving it increased conductivity and so producing absorption of the electric waves.

Neither of these theories seems to meet all the facts. If the daylight effect were an action of light on the sending antenna alone, it should be produced independently of the distance of the receiving station, whereas it is essentially a cumulative or long-distance effect.

Again, so far as measurements of the electric conductivity of air have been made, they do not give support to the theory that the daylight effect is due to air conductivity produced by ionisation, because measurements of this conductivity show it to be too small to account for the observed wave attenuation.

Prof. G. W. Pierce has made calculations which show that the air conductivity would have to be 100,000 times greater than it actually is to account for even a part of the observed effect at 3,000 km. distance.

Prof. Zenneck also agrees that atmospheric conductivity by ionisation cannot account for the phenomena.

Let us in the first place consider theoretically the propagation of an electromagnetic wave through a medium possessing dielectric constant (K) and conductivity ($\sigma$).

It is quite easy to obtain an expression for the absorption coefficient of such a medium. Starting from the Maxwellian equations as above, we have the quantity denoted by $k$ on a previous page defined by the equation

$$k^2 = \frac{\mu K p^2 + j 4\pi\mu\sigma p}{c^2}.$$

Since $k$ is a complex it can be represented by $k = \alpha + j\beta$.

Hence we have

$$\beta^2 = -\frac{\mu K p^2}{2c^2} \pm \sqrt{\frac{16\pi^2\sigma^2\mu^2 p^2}{4c^4} + \frac{\mu^2 K^2 p^4}{4c^4}},$$

and if $\frac{\sigma}{pK}$ is a small quantity, as it is when the conductivity is small, and the frequency $p/2\pi$ is large, we have then

$$\beta = \frac{2\pi\sigma}{c\sqrt{K}}.$$

If we consider a plane wave, the amplitude of which varies as $\epsilon^{j(kx - pt)}$, it attenuates in amplitude to $1/\epsilon$ of its initial value in travelling a distance

$$1/\beta = \frac{c\sqrt{K}}{2\pi\sigma}.$$

If $\rho$ is the resistivity in ohms per centimetre cube, then $\rho = (9 \times 10^{11})/\sigma$, and we have

$$\frac{1}{\beta} = \frac{\rho\sqrt{K}}{60\pi}.$$

We can, therefore, determine at once the absorption effect of any conducting dielectric of which the resistivity in ohms per centimetre cube and the dielectric constant are known. Thus, supposing the dielectric constant is 9, and the resistivity 500 megohms per centimetre cube, the value of $1/\beta$ would be nearly 80 km., or 50 miles. This is, then, the distance in which the wave amplitude would be reduced to about one-third of that at the origin. It is

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clear, therefore, that to propagate waves for any considerable distance through the earth's crust the specific resistance would have to be as high as 1,000 megohms per centimetre cube; also, it is evident that unless the resistivity of the air, as produced by ionisation, is less, say, than 20,000 megohms per centimetre cube, or considerably less than $10^{20}$ electromagnetic units, the ionisation cannot be the cause of the daylight absorption.

I believe no one has observed so low a resistivity for air near the earth's surface, or even 1,000 ft. up, as $10^{19}$ C.G.S. electromagnetic units per centimetre cube. The point, however, requires further investigation. On certain assumptions this atmospheric resistivity can be determined by elevating a captive balloon to the required level by a wire and measuring the potential of the balloon when the wire is insulated and also the current flowing through the wire when the wire is earthed. The ratio of the current in amperes to the potential in volts gives us the total conductivity S of the air. If C is the electrical capacity of the balloon, and if $\sigma$ is the conductivity of the air, then it can easily be shown that $S=4\pi C\sigma$ (*see* J. A. Fleming, "Principles of Electric Wave Telegraphy and Telephony," 2nd edition, p. 725). Accordingly, $\rho=4\pi C/S=4\pi CI/V$, where I is the total electric current flowing along the wire to the earth and V is the potential of the balloon.

### Atmospheric Electricity

Some useful measurements of this kind, made by Messrs. A. J. Makower, W. Makower, W. M. Gregory, and H. Robinson in 1910 ("An Investigation of the Electrical State of the Upper Atmosphere made at Ditcham," *see* "Quarterly Journal of the Royal Meteorological Society," Vol. XXXVII., October, 1911), showed that the total resistance from a certain kite at a height of 1,400 ft. on a certain day was 1,000 megohms. Assuming a kite capacity of 100 electrostatic units, this corresponds to a resistivity of the air equal to $12{\cdot}5\times10^{11}$ ohms, which seems rather small. A plane electric wave would, however, have to travel nearly 60,000 kms. in this air to have its amplitude reduced to $1/\epsilon$. Hence, even this conductivity is not enough to account for the observed attenuation by daylight of long radiotelegraphic waves.

Unless, therefore, there is very much greater atmospheric conductivity than 1 billionth of a mho (1 bimho) per centimetre cube, at or about 1,000 ft. or so above the earth's surface, it does not appear as if air conductivity caused by ionisation due to ultra-violet light could account for the diminished amplitude of radiotelegraphic waves during daytime.

The careful measurements of the air conductivity at various heights and at various hours of the day and night over sea and land would give us valuable data for further testing this matter.

Sommerfeld suggests that the daylight reduction is due to the increase in the value of the coefficient $k$ for the air by the production of conduction due to ionisation. The effect of this is to increase the value of the "numerical distance," and, therefore, to reduce the intensity both of the surface and space waves. He supports this view by an observation made by Ebert, who states that he measured the conductivity of the air in brightest sunshine at a height of 2,500 metres during a balloon ascent, and found it to be 23 times greater than at the ground level.*

It is possible that some part of the effect may be due to actions taking place quite close to the sending antenna. This view may be supported by the interesting observations made during the nearly total solar eclipse on April 17th last on the effect of the temporary diminution of daylight on the strength of radiotelegraphic signals.

### At Eiffel Tower

Whilst visiting the Eiffel Tower station at Paris, Commander Ferrié, who is in charge of this station, informed me a slight increase in the strength of the signals at distant receiving stations had been noticed at the time of greatest observation of the sun at Paris.

Also in Denmark Mr. H. Schledermann stated that observations made between the Royal Dockyard station in Copenhagen and the Blaavands Huk lighthouse on the North Sea at 300 km. distance showed that during totality the signal strength was increased.

Also in England Dr. Eccles noted an increase in the strength of atmospheric strays and signals from Clifden, observed in London during greatest obscuration. These observations show that even a partial diminution of the sun's light is sufficient to increase the strength of radiotelegraphic signals, possibly by an action on the air between the station, and especially on that near the transmitting station.

I suggest that it would be well worth while to erect temporary transmitting stations on and off the line of totality during the future total solar eclipses for the purpose of observing the effect of radiotelegraphic signals sent out from them to other receiving stations.

Another possible explanation of this daylight diminution has, however, occurred to me which I should like to submit to you. It is well known that sound is better heard when the

* *See* "Ann. der Phys.," Vol. V., p. 724, 1901.

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wind is blowing from the source to the observer than when it blows in the opposite direction. It is also known that there are curious vagaries in sound transmission whereby loud sounds are heard sometimes better at great than at short distances. These effects were explained by Sir George Stokes as due to the fact that the velocity of sound is greater when moving with the wind than against the wind. Now, owing to friction and other causes, the velocity of the wind is generally greater at a height above the earth's surface than at the ground level. Hence, if a sound wave is travelling outwards from a centre against the wind, the upper parts move more slowly than the lower parts of the wave front, and hence the ray direction is tilted up and the sound passes over the observer's head.

**Ionisation of Upper Layers of Air**

The suggestion I venture to make is that, when the upper layers of the air are ionised, the ions act as condensation nuclei for water vapour, and the presence of these numerous water spherules gives the upper air a larger dielectric constant.* Therefore an electric wave moves more slowly in it than in non-ionised air. Hence, if a plane wave is moving parallel to the earth's surface, and the upper layers of air are ionised by light, the greater velocity of the wave front at the lower levels causes it to slope backwards and the direction of the ray is elevated, so that it may pass over above the receiving antenna and not affect it.

Suppose, for the sake of simplicity, we consider a plane wave of vertical height $h$ moving between two places at a distance D. Let V be the velocity in non-ionised air and $V_1$ that in ionised air, and K and $K_1$ the corresponding dielectric constants. Let the upper part of the wave be in the ionised air and the lower part in non-ionised air, and let these two regions shade into one another. Then, if in a time $t$ the lower part moves forward a distan e $V_1 t = x_1$, the upper part moves a less distance, $Vt = x_1$, and the wave front slopes backwards by angle whose tangent

$$= \frac{V - V_1}{h} t = \frac{V - V_1}{V} \frac{x}{h} = \left(1 - \sqrt{\frac{K}{K_1}}\right) \frac{x}{h}.$$

Therefore, at a distance D, the normal to the earth end of the wave front will intersect the vertical at a height $h_1$, such that

$$\frac{h_1}{D - x} = \left(1 - \sqrt{\frac{K}{K_1}}\right) \frac{x}{h}.$$

Suppose the height of the receiving antenna is H and that $H - h' = y$, then we have

$$y = H - \frac{1}{h}\left\{\left(1 - \frac{\sqrt{K}}{\sqrt{K_1}}\right)(Dx - x^2)\right\}.$$

The quantity $y$ is a measure in a certain sense of the effect which would be produced on a receiving antenna placed at the distance D. If, then, $K = K_1$, or if there is no ionisation, $y$ has a maximum value equal to H. Also, if K and $K_1$ have any assigned ratio, $y$ has the same maximum value H, for $x = 0$ and $x = D$, but a minimum value for $x = D/2$. Again, if $x = D/2$ and D and $h$ are constant, then $y$ is less the greater the ratio of $K_1$ to K.

Accordingly, if in the upper region of the air the ionisation of the air by ultra-violet light increase the dielectric constant so as to retard slightly the wave velocity, the wave front would be tilted backwards, and at long distances the waves might pass so far above the receiving antenna as to weaken very greatly the signals.

This tilting up of the ray will occur when the ionisation of the upper air has taken place over a part of the interval between the stations. It will be most pronounced when the greatest difference exists between the dielectric constant at the earth level and that at a level a few miles up in the air. At very large distances, say 2,000 miles, an extremely small difference in the dielectric constant of the air at low and at high levels would be sufficient to give the wave

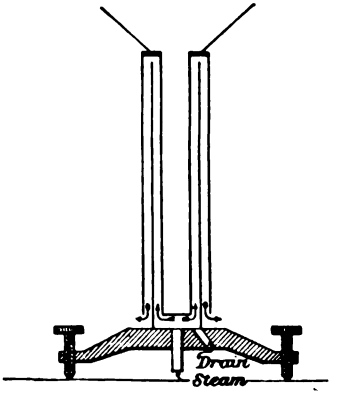


*Fig. 5.*

front a sufficient tilt to make the waves pass far above a receiving antenna 200 ft. high, and so weaken immensely the received signals, because the effect is cumulative, and noticeable, therefore, only at very great distances. As an experimental contribution to the subject, I have made some preliminary observations on the dielectric constant of air filled more or less with damp steam or warm mist. A tubular condenser was constructed (Fig. 5) of such kind that steam from a small boiler could be blown

* *See* Sir J. J. Thomson, "Conduction in Gases," p. 217, who says that air exposed to ultra-violet light may be regarded as full of extremely minute drops of water.

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between the tubes, and the tubes were so supported that the condensation of the steam could cause no loss of insulation. The electrical capacity of this condenser was determined carefully by the Fleming and Dyke capacity bridge, using a telephone as detector and alternating currents having a frequency of 2,760.* Employing all necessary precautions, and comparing the dielectric constant taken as unity of air nearly saturated with water vapour with air having water globules or damp steam in it, we found that the dielectric constant of air filled with water spherules varied from 1·026 to 1·004, according to the amount of damp steam present in the space. In other words, an electric wave would travel more slowly in the steam-impregnated air than in the ordinary saturated air in the ratio of 980 to 1,000, or 998 to 1,000, or anything between these limits.

If, then, we consider a plane electromagnetic wave travelling with plane vertical, and its lower end in ordinary air and its upper end in air containing minute water spherules, the upper end would travel more slowly than the lower, and the wave front would acquire a backward tilt sufficient in a distance of a few hundred miles to carry the wave right above an ordinary receiving antenna. If the ionisation of the upper air by ultra-violet light results in the production of condensation nuclei which condense water vapour round them, then it is highly probable that the upper levels of the air have a slightly greater dielectric constant than the lower, and a difference of even a very small fraction of 1 per cent. will be cumulative in its action on the wave in giving the wave front a backward tilt in travelling over long distances.

### Transatlantic Experiments

Mr. Marconi states that over the Atlantic he has found the maximum daylight effect to occur when the shadow boundary was about half way across the Atlantic, the sending station being in daylight and the receiving station in darkness. I think the well-known "sunrise nick" in the signal intensity curve is due to the fact that the effect is at a maximum when the greatest difference exists between the state of the upper air as regards ionisation and that near the earth. Later in the day convection currents arise to churn up the air and bring it more into a homogeneous condition, which, whatever may be the state of ionisation, is unproductive of any tilt in the wave front.

It has been frequently suggested that an explanation of long-distance radiotelegraphy may be found in the reflection of the electromagnetic waves at the under surface of a layer of ionised air in the upper atmosphere. No proof, however, has been given that this hypothetical layer of ionised air has a sufficiently defined surface to cause wave reflection. It is true that refraction may produce a change of ray direction which simulates reflection, as in the case of the phenomenon of the mirage. In this case the intense heat of the earth expands the layer of air next to it, and lowers its refractive index. Hence, the lower end of a plane wave of obliquely incident light travels faster than the upper end, and may do so to an extent sufficient to swing the ray right round, as if it were reflected from the layer of heated air. For a similar effect to occur with radiotelegraphic waves it would be necessary for the upper end of the wave front to travel much *faster* than the lower end. In other words, the upper end must be in a region of less dielectric constant than the lower end. We have no proof that this is the case. Hence it is also improbable that anything like copious reflection of long electromagnetic waves could take place at the under surface of a layer of ionised air producing an inverted mirage effect. This point, however, is one open for discussion.

There is no doubt, however, that the earth's atmosphere contains something which acts at times towards radiotelegraphic waves like a fog or mist towards light waves.*

### Freak Messages

There are also occasions of unusual transparency when waves of 300 or 600 metres in length seem to travel round the world in an extraordinary manner. Ships provided with the ordinary ship transmitters and receivers occasionally pick up signals sent 1,000 miles away. This is not due to special operative skill, but to a temporary transparency of the atmosphere to radiotelegraphic waves.

The next question to which I should like to direct attention is to the present state of the theory of directive antennæ. I need not go very fully into the early history. Mr. Marconi pointed out in 1906 the special qualities of an antenna consisting of a long wire arranged so that part is vertical, but the greater part horizontal, and that radiation takes place most energetically in the opposite direction to which the free end of the horizontal wire points.†

* For a description of this bridge and method of using it, *see* the Paper by J. A. Fleming and G. B. Dyke on "The Power Factor and Conductivity of Dielectrics for Alternating Electric Currents of Telephonic Frequency and at Various Temperatures," "Journal," Inst. Elec. Engineers, 1912.

* Interesting observations have been made on this matter by Admiral Sir Henry Jackson, F.R.S., *see* "Proc." Roy. Soc., Lond., Vol. LXX., p. 254, 1902.

† *See* G. Marconi on methods whereby the radiation of electric waves may be mainly confined to certain directions, etc., "Proc." Roy. Soc., Lond., Vol. LXXVII., p. 413, 1906.

(Continued on page 282.)

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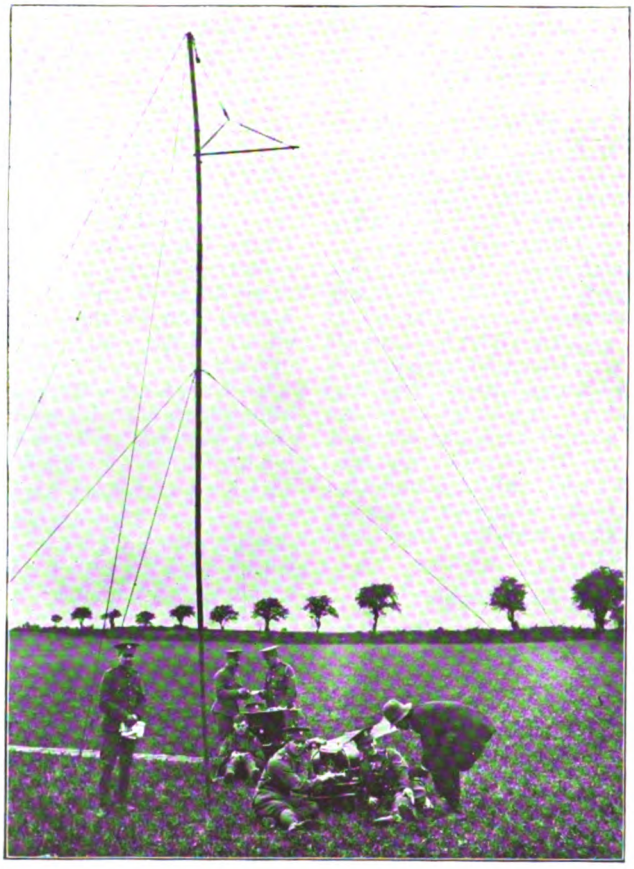
# Lessons from the Army Manœuvres

THE Army Manœuvres in East Anglia have been carried out with a zeal and thoroughness which leaves little to be desired, and as a result much has been learned regarding the entirely altered conditions of modern warfare. Two great factors have revolutionised military tactics—they are aeroplanes and wireless telegraphy, for by their agency nothing can be hid from the alert commander, and it has been proved beyond the shadow of a doubt that the result of a campaign will be little affected by chance, and will depend entirely on the efficiency of the Army and the resource of the scout-line. Arrangements were made for each of the contending armies to be supplied with a strong scout detachment; that of the Red Army including one wireless telegraph company, two signal companies, and two flights of aeroplanes, and an airship; while to the Blues were apportioned three wireless telegraph companies—two of which were supplied by the Territorial engineers, two aeroplane flights, and the "Gamma" airship.



*A Marconi Cavalry Station at the Manœuvres.*

But nothing helped scout work so much as wireless, and it was used more extensively than ever on this occasion. The Army is now equipped with three different types of portable stations. There are the pack-sets for cavalry, which can be in action within 10 minutes from halting, and have a transmission range of 50 miles; three such sets have been in use, and two others have been arranged for cart transport for use with Infantry.

The former were largely used by reconnoitring Cavalry detachments, and with conspicuous success. Here is one instance of its usefulness. A reconnoitring detachment was able, by skilful manœuvring, to get round, without interception, to the flank of the enemy. Here they were able to make important observations, and the information they obtained was, by means of their station, transmitted over the heads of the enemy to the Cavalry headquarters. Then, again, the low masts of the station were found of great advantage, for they seldom reached beyond the topmost boughs of the surrounding trees, and, with a woody background, were entirely out of observation by the enemy. On more than one occasion the reconnoitring party were surprised in their apparent security, and a hasty retreat had to be made to avoid capture. Then the quickness with which the apparatus could be packed up was a quality that could not be too highly appreciated, for it allowed the party to get clear away, where a more intricate or heavier outfit would have meant either the capture of the party or the loss of the station to the enemy.

There were also in use two cart sets. These

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were found of immense service when erected at a stationary base, whence it was possible to maintain communication between military outposts who—from the nature of their service—were frequently required to change their position. The cart set is altogether heavier and a more intricate type of station, much less adaptable for swift transport. It has, however, great powers of transmission, for its range exceeds 200 miles—a useful asset indeed. It is designed for wheel transport, and is not difficult of erection, for it can be got into working order within the space of 15 minutes.

The motor-car set was here, there, and everywhere, and was found peculiarly serviceable in field work, for it combined the two advantages of the pack and the cart sets, and having a wide range (about 200 miles) it could be transported and erected with incredible swiftness in the most out-of-the-way parts in the field of operations, and communicate with headquarters from distances beyond the range of the pack sets, while the fact that its musical note was found to be peculiarly distinct commended it highly to the operating engineers and officers in charge.

*Transporting a Wireless Station over difficult ground.*

Another interesting episode of the manœuvres was the work carried out conjointly between airship and wireless. The "Gamma" airship more particularly did great service to the Blues by reconnoitring and discovering the position of the enemy and reporting continually by wireless to the headquarters.

## The Panama Canal Act

THE text of the new Panama Canal Act, which was signed on August 26th, at Washington, by President Taft, has now been published. The Act, which provides for "the opening, maintenance, protection, and operation of the Panama Canal, and the sanitation and government of the Canal Zone," has aroused a good deal of attention throughout Europe and America. Section 6 deals with the erection and working of wireless telegraphic installations at suitable places along the Panama Canal, subject to the International Convention and the Act of Congress to regulate radio-communication, and if necessary by further agreement with the Republic of Panama. The following is the official text of that portion of the section relating to wireless telegraph installations:

> That the President is authorised to cause to be erected, maintained, and operated, at suitable places along the Panama Canal, and the coast adjacent to its two terminals, in connection with the operation of said canal, such wireless telegraphic installations as he may deem necessary for the operation, maintenance, sanitation, and protection of said canal. If it is found necessary to erect such installations upon territory of the Republic of Panama the President is authorised to make such agreement with said Government as may be necessary, and also to provide for the acceptance and transmission by said system of all private and commercial messages, and those of the Government of Panama, on such terms, and for such tolls as the President may prescribe; *Provided*: That the messages of the Government of the United States and the Departments thereto, and the management of the Panama Canal, shall always be given precedence over all other messages. The President is also authorised in his discretion to enter into such operating agreements, or leases, with any private wireless company as may best assure freedom from interference with the wireless telegraphic installations established by the United States.

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# The Lighter Side of Wireless

## A Code of Morals.

(Via Wireless.)

Adapted by THOS. APPLEBY.

*With apologies to Kipling.*

NOW Jones had left his new-wed bride to keep his house in order,
And hied away to the Hurrum Hills above the Afghan border
To sit on a rock with his Wireless ; but ere he left he taught
His wife the working of the Code that sets the miles at naught.

And Love had made him very sage, as Nature made her fair ;
So Cupid and Apollo linked, per Wireless, the pair.
At dawn, across the Hurrum Hills, he flashed her counsel wise—
At e'en the Wireless waves still bore her husband's homilies.

He warned her 'gainst amorous youths in scarlet clad and gold,
As much as 'gainst the blandishments paternal of the old ;
But kept his gravest warnings for (hereby the ditty hangs)
That snowy-haired Lothario, Lieutenant-General Bangs.

'Twas General Bangs, with Aide and Staff, that tittupped on the way,
When they beheld a Wireless-Spark tempestuously at play ;
They thought of Border risings, and of stations sacked and burnt—,
So stopped to take the message down—and this is what they learnt :

" Dash dot dot, dot, dot dash, dot dash dot " twice. The General swore.
" Was ever General Officer addressed as ' dear ' before ?
' My Love,' i'faith ! ' My Duck,' Gadzooks ! ' My darling popsy-wop ! '
Spirit of great Lord Wolseley, who is on that Mountain top ? "

The artless Aide-de-camp was mute ; the gilded Staff were still,
As, dumb with pent-up mirth, they booked that message from the hill ;
For, clear as summer's lightning flare, the husband's warning ran :
" Don't dance or ride with General Bangs—a most immoral man."

At dawn, across the Hurrum Hills, he flashed her counsel wise—
But, howsoever Love be blind, the world at large hath eyes.
With damnatory dot and dash he Wirelessed his wife
Some interesting details of the General's private life.

The artless Aide-de-camp was mute ; the shining Staff were still,
And red and ever redder grew the General's shaven gill.
And this is what he said at last (his feelings matter not) :
" I think we've tapped a private line. Hi ! Threes about there ! Trot ! "

All honour unto Bangs, for ne'er did Jones thereafter guess
By word or act official who read off that Wireless ;
But the tale is on the Frontier, and from Michni to Mooltan
They know the worthy General as " that most immoral man."

---

## Signs of the Times.

THE Priest of Urim and Thummim ! An excellent name ! A name that conjures up visions of the prophet, with his wild eye " in a fine frenzy rolling," and his skinny hand clutching ecstatically at the void. But there you are mistaken, dear reader, for the prophet has climbed down from the exalted heights of soothsaying and subjected his soul to the pen—he has written a book. It is called " The Signs of the Times." The purpose

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of the book is evident from its very title, and the expectant are not disappointed when the pages are cut and the secrets disclosed.

Many and awful are the prognostications which animate the printed words and make them dance before a perfervid imagination like demons in their cohorts. You see, the whole gist of the book is that the world—the great Babylon—is rushing headlong to its ruin. The heavens are eloquent with disaster. The earth is full of the signs of the times ; and these are interpreted for the uninitiated by the Priest of Urim and Thummim. "Mankind," he cries, "is too presumptuous." "He has the audacity to invent," and—looking round for an example—he espies the aerials fitted to the roof of Marconi House, and therefrom takes his cue. Wireless telegraphy, he assures his readers, is the leading example of such presumption. "We" (he uses the impressive plural, but it is doubtful whether he intends the apostolic or the journalistic "we")—"*We* could have propounded the theory about the time its inventor was at school, but refrained because its consequences were so manifestly dangerous." Ah ! What a thing it is to be a prophet. But it is a thousand pities that the foreseeing one should have waited for the accomplished fact before he gave us the benefit of his inspiration. Then we might have nipped this awful invention in the bud. As it is, Marconi now "girdles the earth in 40 minutes," and has given us edged tools to play with. For terrible beyond conception are to be the results of wireless telegraphy : "It will disturb the omnipresent ethers of space. . . . It will loosen the polar ice-packs and bring them into warmer seas. . . ."

But wireless would be a mere bagatelle if its damaging powers could do so little. Fortunately, the priest can assure us that it will cause earthquakes, landslides, volcanic upheavals, tidal waves, and pit accidents, etc., etc., etc.

Well—well. The fervent minds of the age have at least one consolation. Whatever else we may have to suffer, the times are not going to be dull.

## A Unique Record.

THE s.s. "Miltiades," on its arrival recently, made a unique wireless record *en route*. From the time she left London until her arrival in Hobson's Bay, Port Melbourne, she was in constant wireless communication with either ships or land stations. Had the vessel been journeying by the Suez route there would not have been anything very wonderful in this, but she came via the Cape of Good Hope, and across the long stretch of the Southern Ocean to Melbourne, where it is almost the universal rule for vessels to sight nothing but sea and sky. She was accompanied at some distance suitable for the interchange of wireless signals by the New Zealand Shipping Co.'s "Rotorua." The result was that not a day passed without the wireless apparatus being in use. Right until the "Miltiades" sighted Cape Otway she interchanged signals with the "Rotorua," and then she dashed a message of farewell to her fellow voyager, and got into touch with the steamer "Themistocles" at Port Melbourne. The "Miltiades" had five days of easterly gales after leaving Capetown. This achievement has inspired "Max A." to contribute the following to the *Melbourne Punch* :—

There's a message goes through the trembling air,
"Hello, 'Miltiades !' Are you there ?"
Vast and lone in the heaving green
Under the stormy sky,
And never a sail nor smoke is seen,
Nor ever a ship goes by ;
But the message rides o'er the shaken seas,
"Hello ! 'Miltiades !'"

No day comes but that whisper wings
Its wondrous way, where the good ship flings
Spume and spray from her pitching prow,
Smoke and soot from her fires ;
For man has conquered all distance now
With one little span of wires ;
And speaks with one faint touch of the keys,
"Hello ! 'Miltiades !'"

There is no spot now where a man may go,
Be it burning desert or Polar snow,
But there the voice of a friend will come
Bidding him hope for aid ;
There is no place now where the world is dumb,
Or lonely, or left afraid ;
But universal are words like these,
"Hello ! 'Miltiades !'"

And planet to planet yet shall call,
With mind triumphant across them all ;
Spinning around their lord the sun,
Each in its own great track,
The outward message each day will run,
And the answer come dancing back,
As it danced on the rolling southern seas,
"Hello ! 'Miltiades !'"

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THE MARCONIGRAPH

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The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

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### The Share Market

London: September 24th.

The market in the various Marconi issues has been fairly active during the past month. There has been a considerable rise in prices since our last issue, although, owing to adverse rumours which should not be taken seriously, there has been a slight set-back from the highest figures.

There has been good investment buying, both from home and abroad, on the anticipated results of the large work that is being done by the parent Company and its subsidiaries, more especially the American Company, which has made some important extensions.

The prices as we go to press are: Ordinary, $5\frac{1}{8}$; Preference, $4\frac{1}{2}$; Canada, 24s.; Spanish, $1\frac{5}{16}$; American, $1\frac{3}{4}$.

### "The Marconigraph."

Wireless developments continue unabated; and every month the task of squeezing all the latest information between the covers of THE MARCONIGRAPH becomes more and more difficult. Last month the only alternative open was to increase the number of pages to sixty-four. This month the difficulty has recurred, and has once again been overcome by the addition of more pages, and the number is now seventy-two. This increase is due in some measure to the extra space necessitated by an account of the proceedings at the annual meeting of the British Association, which included an important discussion on Wireless Telegraphy. This was opened by Professor Fleming, who is well known to our readers, and his remarks are of such great interest that they have been published *in extenso* in this number.

### Admiralty Wireless Expert

The Admiralty give notice that, with the concurrence of the Treasury, the post of Expert in Wireless Telegraphy has been removed from Schedule B of the Order in Council of January 10th, 1910. That schedule empowers the Civil Service Commissioners to make appointments to certain offices without the nominees having to pass a Civil Service examination. The appointment of Expert in Wireless Telegraphy, which is at present held by Mr. H. A. Madge, who is attached to H.M.S. "Vernon," has hitherto been made in accordance with the provision of Schedule B of the Order in Council of January 10th, 1910, but future appointments will be made as a result of Civil Service examinations.

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### Accident to Mr. Marconi

Rome, September 26th.

A motor-car, in which Mr. Marconi was proceeding with Mrs. Marconi from Coltano to Genoa, came into collision with another car near Borghetto. Mr. Marconi sustained an injury to his right eye. He was conveyed in a car belonging to the local naval commander to the naval hospital, where he received first aid. The injury is being examined by doctors, but is not thought to be dangerous. Mrs. Marconi escaped unhurt.

### New French Naval Wireless Station

The Minister of Marine has decided upon the creation at Barfleur Point of a wireless telegraphy station for the exclusive use of the Maritime Prefecture in time of peace, and of the Commander-in-Chief of the defence service in time of war, when communicating with ships at practice or employed on any service in the Channel. The transmitting range of the new post is only to be about two hundred miles—that is to say, the distance separating Cherbourg from Brest on the one hand and Dunkirk on the other.

### Wireless and Weather

In an article which appeared in THE MARCONIGRAPH fourteen months ago, we gave some indication as to the extent to which wireless telegraphy aided meteorology. The preparation of charts issued from the Meteorological Office is largely dependent upon telegraphic reports from different regions. Until the advent of wireless, however, large regions were left untouched, and instead of possessing precise data from such areas as is now available by means of Marconi wireless telegraphy, the Meteorological Department had to depend to a large extent upon empirical data.

From an examination of the Seventh Annual Report of the Meteorological Committee to the Lords Commissioners of His Majesty's Treasury, it is possible to glean some interesting figures relating the wonderful progress which has been made in the development of the application of wireless telegraphy to meteorology. During the year ending March 31st last 68 wireless telegrams were received from ships of His Majesty's Navy, and 4,922—or nearly 1,000 more than in the previous year—from Atlantic liners.

Only 232 out of the total of nearly 5,000 messages reached the office in time to be included in "to-day's" map in the daily weather report—*i.e.*, within about four hours of the time of taking the morning observations; 2,352 messages, or rather less than half the total, reached the office in time to be included in one of the two maps for "yesterday" shown in the daily weather report. As the forecasts are prepared within about two hours of the time of observing, it is evident that very few messages reached the office in time to be of direct and immediate application in the preparation of forecasts or the issue of storm warnings.

Nevertheless, there were again a number of occasions on which the messages were of great assistance to the forecaster They often gave the earliest observations of the westerly or north-westerly winds in the rear of a depression, and so put him in a position to forecast the early extension of these winds to western districts. Such cases occurred on May 2nd, July 14th, July 24th, Steptember 1st, November 28th, and January 15th. On other occasions the extension of southerly winds to some distance from our western coasts increases the probability of a continuance of southerly winds over the British Isles for the whole 24 hour period covered by a forecast. Such cases occurred on December 1st, January 8th, and March 1st.

Wireless reports have also proved valuable in connection with the issue of a "further outlook," especially when it takes the form of a notification of a probable spell of fair weather. Such a notification would not be issued if wireless reports showed the existence of important disturbances over the ocean.

The number of occasions on which wireless reports conveyed information which would have been useful, but came to hand after the issue by the Meteorological Department of forecasts, was unfortunately considerable. A conspicuous example occurred in connection with a gale one November night. Wireless reports received subsequently indicated a very deep disturbance in Long. 25° W. Had this information been in the hands of the forecaster sufficiently early, storm warnings would have been issued to all Scottish coasts. As it was a severe gale occurred, for which no forewarnings were issued. This incident only shows the great services which wireless reports can render in forecasting weather reports. There have been innumerable instances where the wireless messages have been of great service in connection with the issue of the modifications of spells of settled weather, and it would be possible to cite many recent occasions on which the wireless messages were of great assistance to the forecasters.

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# Long Distance Wireless Telegraphy

## Important Commercial Developments

### The Norwegian Contract

THE announcement made in the Press on the sixth of September that a contract had been signed between the Norwegian Government and Marconi's Wireless Telegraph Company, Ltd., marks another important stage in the development of Trans-Atlantic communication. The necessity for some direct means of communication between America and Northern Europe had long been recognised, and M. Heftye, the Director of Norwegian Telegraphs, was pursuing a progressive and far-sighted policy when, at the request of the Government, he entered into negotiations, and finally effected a sound business transaction with Marconi's company for the opening up of a commercial telegraph service between Northern Europe and America. By the terms of the agreement Marconi's Wireless Telegraph Company are to build two high-power wireless stations. One is to be erected on a site yet to be chosen in Norway, and for this they are to receive the sum of £70,000, exclusive of site foundations and buildings. The site of the other is in the vicinity of New York, and in this case the expenses incurred by the purchase of land and the cost of the building will be covered by a royalty of 10 per cent., which is to be allowed on the gross receipts of the enterprise. The stations are to be erected as quickly as possible, and must be completed within twelve months from the time that the foundations and buildings are ready.

It has further been arranged that the receipts of the joint stations will be pooled and divided equally between the Marconi Wireless Telegraph Company of America and the Norwegian Government. This agreement will remain in operation for the period of 25 years, and at the end of that time the Norwegian Government will have the right to renew it.

The Norwegian station will in all probability be erected at Bergen, and will be the central station for the whole of Scandinavia, Russia, and possibly for all the important other districts of North Europe. Here local stations will be established, which will communicate with the Norwegian centre. Thence messages will be sent direct to the station at New York—that is to say, they will be transmitted over a distance of 3,750 miles. To enable this to be accomplished satisfactorily the stations are to be supplied with very powerful apparatus, and when the line of communication is completed the Norway-American "call" will be one of the longest links in the world's chain of wireless telegraphy.

### Trans-Pacific Wireless

With regard to the reports of long-distance wireless communication across the Pacific (between San Francisco and Honolulu), which the Federal Wireless Telegraph Company claim to have established by means of the Poulsen system, Marconi's Wireless Telegraph Company, Ltd., are erecting at these places stations of the same type as those which it is proposed to construct for the British Imperial scheme. The new Marconi station at Honolulu has been so designed as to enable wireless communication to be established at a little later date with similar stations to be erected by the Marconi Company at Yokohama and in the Phillipine Islands.

The Marconi Wireless Telegraph Company of America have commenced proceedings for infringement of patent against the Federal Wireless Telegraph Company.

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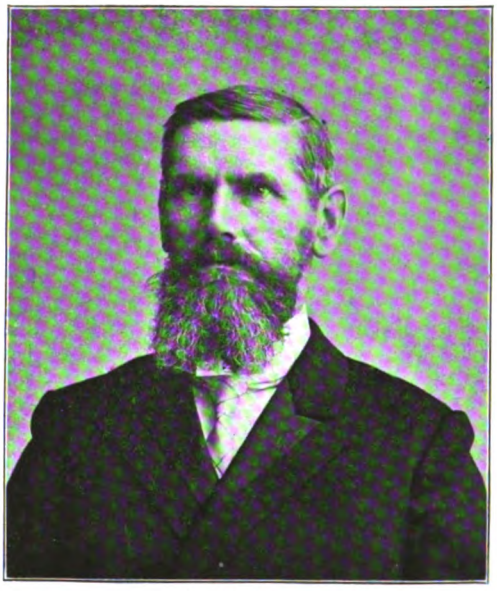
## Obituary

IT is with great regret that we record the death of M. Homberger, which took place on August 17th at Berne. M. Homberger was one of the secretaries of the Bureau International de l'Union Télégraphique, which he represented at the International Radiotelegraphic Conference in London in June last.

It was while staying in London that M. Homberger met with a serious accident and was compelled to return to Berne before the



*M. Homberger.*

termination of the Conference, much to the regret of his fellow-delegates, who thereby lost the assistance of a foremost authority on International Radiotelegraphy. M. Homberger was born at Zurich in 1854, and entered the telegraph service of the Swiss Federal Administration in 1871, thence he entered the International Bureau of the Telegraph Union, to which he was ultimately appointed first secretary. In this capacity he took part in the International Telegraph Conferences of Budapest (1896), London (1903), Lisbon (1908), in addition to the Congress held in London this year.

## Cargo Equipment at a Newcastle Exhibition

AN electrical exhibition was held at Newcastle-on-Tyne during the past month, and the two exhibits of Marconi's Wireless Telegraph Company made a strong appeal to the thousands of visitors. Indeed, so keen was the interest displayed in these two stands that they were often difficult to approach on account of the huge crowds which surrounded them, and the demand for copies of THE MARCONIGRAPH sorely taxed the resources of the Publisher. The two stands were at opposite corners of the exhibition hall, and were in constant wireless communication. By these exhibits the company also brought to the notice of the shipping section of the Tyneside community what they have been able to accomplish in the direction of facilitating the installation of wireless telegraph apparatus on cargo vessels. By this new apparatus a message might be sent clearly over a circle of 150 miles, and might be received from shore or ship 1,500 miles away. The apparatus referred to is known as the Marconi ½-kw. cargo set. This is a small power installation designed to produce transmitting waves of 250 and 600 meters, or any intermediate wave with a simple change-over from one to any other. The working transmitting range depends upon the height, length, and shape of the aerial. The receiving apparatus provides for tuned reception of all waves between 250 and 1,600 metres. The working receiving range is also dependent on the aerial. The transmitting plant consists of a rotary converter which gives an alternating current output of ½-kw. It is of the vertical type, and occupies a minimum of floor space. The armature is of a special design, and differs from the ordinary converter by giving at the slip rings a constant alternating current voltage independent of the direct current imput voltage. The machine is designed to suit the direct supply available on the ship. It has eight poles, and runs at 2,250 revolutions per minute, thus giving a spark frequency of 300 per second.

It is stated that since the beginning of 1909—that is, during a period of three years—the passengers on no fewer than twenty-two shipwrecked vessels have owed their lives to the fact that the ships were equipped with a wireless telegraph system, and were consequently able to send out messages for assistance.

✦

According to a vote taken among a thousand prominent men of science throughout the world by a popular Chicago magazine, wireless telegraphy is considered the greatest of the seven wonders of the modern world. The following list shows the order of importance of the seven achievements which are considered the most won erful : 1, wireless ; 2, the telephone ; 3, the aeroplane ; 4, radium ; 5, antiseptics and anti-toxins ; 6, spectrum analysis 7, X-rays.

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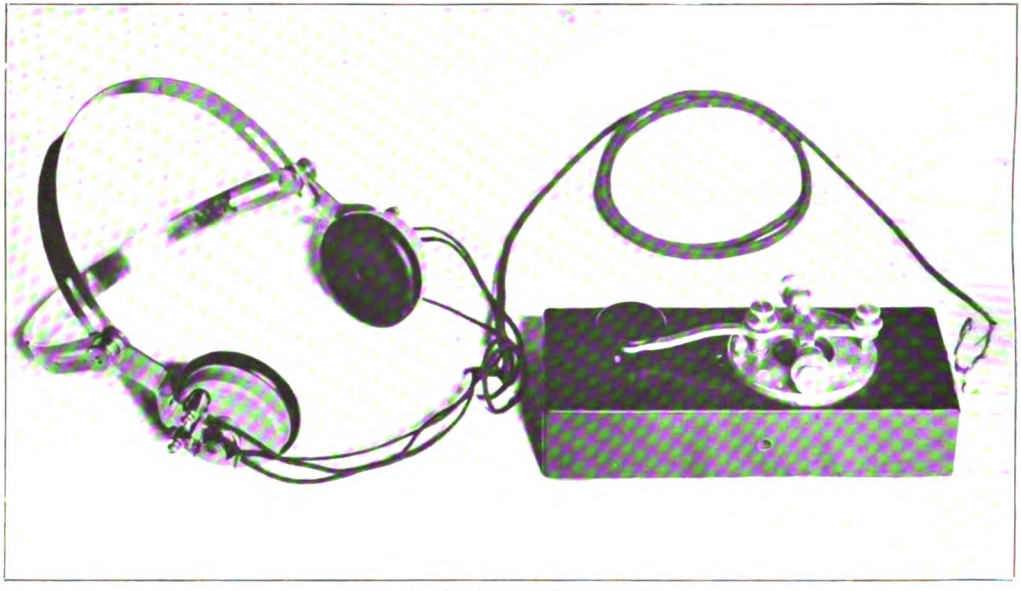
# A New Practice Set for Learners

## With Notes on the Morse Code

THE problem which had faced those who were desirous of learning how to send and receive wireless signals—and their number must have increased very considerably of late by the multiplication of Boy Scouts companies—has probably deterred many private persons from pursuing a practical training in wireless telegraphy. The smallest wireless station at present available is known as the "Knapsack" station. This has already fully proved its value, and seems destined to become an indispensable portion of the outfit of Territorial and Boy Scout companies. But the cost of such a station would probably be too heavy an outlay for many persons, whose main object is to receive instruction in the Morse code as applied to wireless telegraphy.



*The No. 2 Marconi Practice Set.*

The subject has a fascination for many thousands of people, who would undoubtedly take a keener practical interest in wireless telegraphy were they acquainted with the fact that there is obtainable apparatus that will bring their hobby within range of even the most limited purses. This is now possible by means of the Marconi Practice Set, which can be used for the twofold purpose of giving and receiving instruction in telephone Morse signalling, and for testing both the keenness and speed of operators. The set has been carefully designed and constructed, and is in every respect up to the high standard of all apparatus manufactured at the famous Chelmsford works. Some people entertain the idea that because such apparatus is small and inexpensive, and intended to be used by learners, that anything cheap will answer the purpose. Such an idea, however, is not only erroneous, but is positively harmful to those who take a serious interest in wireless telegraphy, for they might be disagreeably surprised to discover, at a time when they desired to put their training to some practical purpose, that the signals used by a wireless station were of an entirely different kind from those with which they were familiar through using a toy practice set purchased without any consideration. What this defect would mean to Boy Scouts or to the electrical amateur is sufficiently obvious without labouring the point. With the Marconi Practice Set there is no danger of such a thing happening, for with this instrument it is possible to reproduce almost exactly

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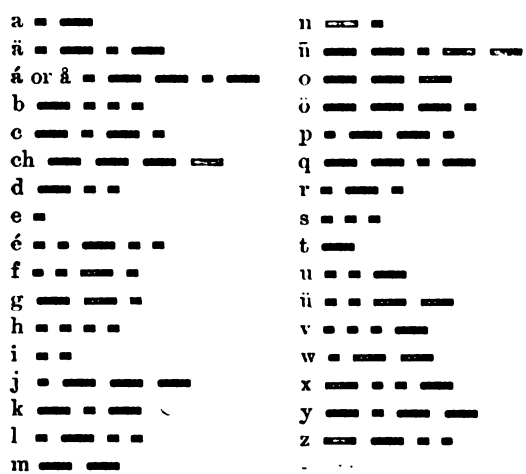
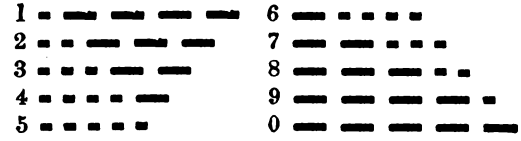
the kind of signals obtained with wireless telegraph stations. Thus, anybody learning to communicate with this apparatus will have an excellent training for working on a wireless station when the opportunity arises.

There are two forms of Marconi Practice Set, that known as No. 2 being the cheaper of the two. It is shown in the accompanying illustration, and its compactness will at once impress the reader. The apparatus is enclosed in a highly finished teak box, on which is mounted the operating key. Enclosed in the box is the battery, which is very easily removed when required for replacement. The terminal block fitted in the end of the box is made to slide, and by this means it is possible to vary the strength of signals in the telephone. The adjusting screw of the buzzer can easily be reached by a small screw-driver through a bushed hole in the side of the box. A single headpiece is provided with the instrument, but a double headpiece, such as is illustrated, can be supplied if required. Owing to its extreme portability and low price, the instrument is admirably suited for instruction in the reception and transmission of wireless messages, and it will be found to be of special advantage to Scout and Cadet corps.

As the Practice Set which we have just described is primarily intended for the reception and transmission of Morse signals, it might be advisable to reproduce here the International Code for the benefit of those who are now, for the first time, attracted to the subject. It will be seen that the signals are merely an arrangement of dots and dashes representing letters of the alphabet. The following notes respecting spacing and length of signals should be remembered: (1) A dash (—) is equal to three dots (. . .); (2) the space between the signals which form the same letter is equal to one dot; (3) the space between two letters is equal to three dots; (4) the space between two words is equal to five dots. Letters of the alphabet are shown in the following table:




There is a simple rule by which it is easy to memorise code figures. Thus the figure 1 is represented by one dot, four dashes; 2, two dots, three dashes; 3, three dots, two dashes; 4, four dots, one dash. The figure 5 is represented simply by five dots. From 6 to 10 the order of dots and dashes is reversed, as follows: 6, one dash, four dots; 7, two dashes, three dots; 8, three dashes, two dots; 9 four dashes, one dot; 10, five dashes. The following table will show this more clearly:




In addition to the alphabet and figure code, there is a special code for punctuation and other signs, which it is not necessary to trouble the reader with at this early stage.

## The Chelmsford Mast

THE steel mast, 450 ft. in height, which has been erected by Marconi's Wireless Telegraph Company at their new works at Chelmsford, has now been completed, and forms a land mark which can be seen for many miles round. The mast, which has been erected under the supervision of the company's staff, weighs 70 tons, and is composed of steel flanges formed in four sections, bolted together after being hoisted into position. The inside diameter of the mast is 3 ft. 5 ins., and the outside diameter of the flanges 4 ft. 6 in. Over two thousand 2-in. bolts were used in the construction of the mast, and the steel cable supports are attached to four huge concrete anchor blocks, each representing a weight of 120 tons. In connection with each of these anchor blocks, 260 small piers of asbestos and mica plates, covered with lead caps, have been erected on four feet of concrete, and the remainder of the block built over them. The effect of the little piers is to give the perfect insulation which is so necessary to the effective working of the wireless telegraphy.

The 250 ft. mast, which has recently been used by the company, is now being taken down, and another mast of 450 ft. will shortly be erected.

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(Continued from page 271.)

Also, by the law of exchanges, a bent antenna which radiates unequally absorbs unequally in different azimuths. The question is as to the explanation of the action of this bent antenna.

### The Bent Antenna

In 1906, starting from a suggestion by Sir Joseph Larmor, I gave a theory based on the view that the bent antenna is equivalent to a combination of an open and closed circuit, and assumed the earth to be a perfect conductor. The objection has been raised to this theory that it implies that the directivity should fall off with distance.

Experiments have not yet been made, as far as I am aware, on a sufficiently large scale and at sufficiently great distances to settle this point, and the experimental problem is undoubtedly complicated by the effect of the nature of the soil surface over which the waves travel in different dielectrics or regions. Nevertheless, Mr. Marconi's experiments show that the directivity persists for several hundred miles. Recently the problem has been discussed by H. von Hoerschelmann in the "Jahrbuch der Drahtlosen Telegraphie" (*see* Vol. V., p. 15, 1901). According to his theory, the effect of a bent antenna is entirely due to vertical electric currents which are produced in the earth just under the horizontal part of the bent antenna. Hence the directivity depends on the conductivity of that region of the earth.

Starting from the same system of equations as Sommerfeld, he obtains expressions for the vector potential, or Hertzian function, which show that the function which determines the vertical field in the earth and in the air is dependent on the azimuthal angle in such manner that there is no directivity if the earth is a perfect conductor, but that, if the earth has a finite conductivity under the antenna, then an unsymmetrical radiation takes place, and the directivity once created persists even though the waves travel out later on over a good conducting surface. The mathematical work in Hoerschelmann's Paper needs careful consideration by pure mathematicians to test whether the transformations of the Besselian functions he employs are valid and his analysis correct. He points out that, as a consequence of his theory, a bent antenna situated over a sea surface should not have the same degree of directivity as one situated over a poor conducting soil. These conclusions could easily be checked experimentally.

### The Function of the Earth

The general result of all the theoretical investigations of Zenneck, Sommerfeld, and Hoerschelmann is to show that the function of the earth in radiotelegraphy is by no means confined merely to guiding a space wave, but that it fulfils a most important function in assisting to create surface waves and in permitting earth currents which have directive effect. Recent experiments with antennæ laid on the ground or under the ground by Dr. Kiebitz have turned attention afresh to the matter, although many of Kiebitz's results seem only a repetition of those obtained by Marconi in 1906 with antennæ laid on the ground or a little above it.*

Kiebitz used as receiving antennæ long wires carried on insulators placed in ditches about 1 metre deep. The ends of the wires were earthed through condensers. The receiving appliance was at the centre.

By such antennæ properly oriented he found he could receive signals from all the principal radiotelegraphic stations in England, France, and America.

There is no need to assume that these received waves are propagated through the deep strata of the earth. The effects are exactly what might be expected from waves travelling over the surface.

The chief interest of Kiebitz's experiments lies in the confirmatory proof they give that an elevated antenna is not necessary for *reception*. On the other hand, for long-distance *transmission* an elevated aerial wire or one raised above the earth is requisite.

The chief problem yet to be faced in connection with sending antennæ is to find a form of antenna which will radiate a large power, say 100 kw. to 500 kw., at a relatively low frequency or long wave-length consistently with high antenna efficiency.

There is room for an immense amount of research yet on improved forms of antenna. When we consider that the function of a sending antenna is something like that of a gas mantle or gas fire radiator—viz., to transform into radiation of desired wave-length as large a fraction as possible of the supplied energy—and remember what has been done in the corresponding luminous problem, it is easy to see that countless questions of great practical value in connection with antennæ for radiotelegraphy remain unsolved.

The ingenious method of directive telegraphy due to Bellini and Tosi deserve mention, and suggest that in the case of wireless plant erected on ships means for instantly locating the direction of the arriving waves is a matter of the greatest importance. Although the practical problem is to some extent solved,

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* *See* Dr. F. Kiebitz, "Recent Experiments on Directive Wireless Telegraphy with Earthed Antennæ," "The Electrician," March 8th, 1912.

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there is abundant room for further invention in connection with it.

### Wireless Telephony

We can hardly leave this discussion without some mention of the state and prospects of wireless telephony. The essential condition of success in transmitting speech is the possession of means for creating undamped oscillations or alternating currents of a frequency not less than 20,000. When the Poulsen arc generator was first introduced, it was hailed as a solution of the problem, but practical experience has shown that, whilst experimental feats can be performed with it, it has not the simplicity and ease of manipulation required for commercial work. The modification recently introduced by Mr. E. L. Chaffee, consisting of a copper-aluminium arc in damp hydrogen, the arc being formed between two closely adjacent plane surfaces, appears to be an improvement. The practical solution seems, however, to be in the perfection of some simple easily-managed form of high-frequency alternator. The ingenious inventions of Goldschmidt in utilising the properties of the polyphase motor to increase frequency have been developed by the Lorentz Company of Berlin, and seem likely to result in the production of a practical form of extra high-frequency alternator suitable for radiotelegraphy and radiotelephony.

In addition to the generator, inventors have wrestled with the difficulties of making a microphone transmitter which shall be able to carry a large current without heating. To conduct wireless telephony over any distance we have to modulate in accordance with the wave form of the speaking voice a very large antenna current. The problem has to some extent received solution in the liquid microphone of Majorana, the relay microphone of Dubilier, and a recently invented heavy current microphone of Rühmer.

We seem to be, however, on the track of mechanical means for generating undamped oscillations and microphonic means for modulating them, and wireless telephony is, therefore, even now a practical matter for a few hundred miles of distance. It is quite within possibility it may yet be conducted across the Atlantic.

As regards other inventions, we are still in want of more simple means for recording telegraphic messages. Since the coherer fell out of use the reception is mostly conducted by ear. Somewhat elaborate photographic methods, suitable for large land stations which employ the Einthoven string galvanometer, have been introduced; but what is still required is a means of calling up the operator and of recording the message on board ship which is at least as sensitive as the telephone plus the human ear for ordinary shipboard communication.

The receiver current is, however, very small, and available power is at most a few microwatts in the form of a current of a few microamperes.

There are, therefore, innumerable practical and scientific problems in connection with radiotelegraphy which await solution. These require mathematical, physical, and radiotelegraphic knowledge of a high order to overcome them.

### A Committee Required

This leads me to make a final suggestion. Generally speaking, our method of attacking these problems is by individual isolated efforts. The pure mathematician, however, often sets himself to solve a problem that is too far removed from the actual facts of Nature to be useful, and the physicist to investigate something which is out of touch with immediate technical requirements, whilst the wireless telegraphist, by sheer power of perseverance, backed by financial resources and aided by the unconscious cerebration of genius, manages to arrive at useful results by an expensive, circuitous route, but often cannot explain them when found. I am convinced, however, that most valuable results would ensue from the close co-operation of the pure mathematician, physicist, and practical radiotelegraphist. Why should not a British Association Committee on Radiotelegraphy be formed on the same lines as the British Association Committee on Electrical Units? If such a Committee had on it one or two eminent pure mathematicians, physicists, practical radiotelegraphists, and perhaps a flying man or two to assist in atmospheric exploration, and if they were content to work in hearty co-operation, what valuable work might be done. They might publish at intervals joint reports. The mathematicians would carefully scrutinise such Papers as that of Zenneck, Sommerfeld, and Hoerschelmann, or go over the ground again, and make sure of their logical solidity. The physicists might determine dielectric constants and conductivity for high-frequency currents of air in various states of ionisation, of soils, and earth-crust materials. The radiotelegraphists might collect accurate data on the practical side of the subject, and would keep the others from straying into barren regions of investigation. No one man has sufficiently extensive abilities to enable him to reap in all fields of this large subject, but the conjoint labours of such a union would enable more valuable work to be done in two years than they could separately achieve in ten, and I therefore venture to invite your consideration of the suggestion.

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The basis for all technical achievements is a true scientific knowledge of facts and principles, and what body so fitted to advance it in this case as the British Association for the Advancement of Science ?

What is required in the present state of radiotelegraphy is to restrict everywhere the mere useless amateur playing with wireless telegraphy, such as that which has become an intolerable nuisance in the United States, but is wisely held in check by our Wireless Telegraph Acts in Great Britain. At the same time, all reasonable opportunities should be afforded to serious investigators.

Since the above remarks were put in type a Paper has been published by Dr. Eccles

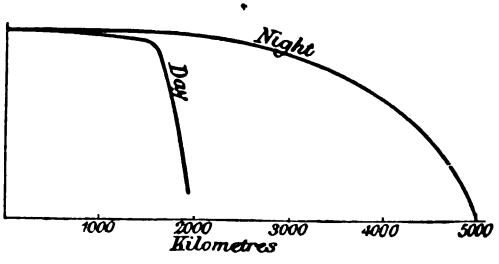


*Fig. 6.*

(*see* "Proc." Roy. Soc., Vol. LXXXVII., A., p. 79, 1912), "On the Diurnal Variations of Electric Waves occurring in Nature and on the Propagation of Electric Waves round the Bend of the Earth," in which a theory is developed of electric wave propagation in ionised air. He gives a mathematical proof that, under certain assumptions as to the mass of these ions, the wave velocity would be increased as compared with that in unionised air, and hence that a plane vertical wave front travelling with lower end near the earth's surface and upper end in air, more or less ionised, would be caused to lean forward by the increased velocity of the upper end. Hence he proves that according to wave-length and circumstances the wave may be better able to follow round the earth's curvature, or may be prevented from doing it. On this basis he has developed a theory of long-distance radiotelegraphy and of the inhibition of daylight upon it.

The chief criticism to which I think this theory is open is that he assumes that the dielectric constant of the air is unaffected by the ionisation or by the condensation of water vapour upon the ions. This is not a safe supposition to make. We know that in the case of solutions in a state of ionisation, such as dilute solutions of metallic hydrates in water, the dielectric constant of the solvent is considerably increased. As a rule, anything which increases conductivity in a dielectric increases also the dielectric coefficient, or at least diminishes in effect the wave velocity. Hence ionisation may do so in the case of air. If the dielectric constant K is increased by ionisation, then in the expression given by Dr. Eccles for the wave velocity, that velocity may be more reduced by this increase in K than it is increased by the presence of the ions.

**Discussion**

CAPT. H. RIALL SANKEY, who followed Dr. Fleming, said his first duty was to apologise for the absence of Mr. Marconi, who had fully intended to be present to take part in the discussion, but at the last moment was called away to the Continent. He had only been able to discuss a few of these matters with Mr. Marconi at the last moment. This absence was really very unfortunate, because many of the questions raised by Prof. Fleming Mr. Marconi could no doubt have answered. The first few questions put by Prof. Fleming were more or less mathematical and theoretical, and he could not say much about them. He would point out, however, that various improvements were being effected, based on experimental results, and that the Marconi Company at the present moment were carrying out a large number of experiments in long-distance transmission under all sorts of conditions in different parts of the world, and in different directions. There was, for instance, a great difference between the case of transmission north and south, and south and north, to what there was east and west. No doubt that might have something to do with the daylight effect referred to by Prof. Fleming, but many of these questions were still very obscure, and the Marconi Company hoped, by these experiments, to have in the immediate future, or, at any rate, shortly, data which would answer many of them. Isolated results were of little use. It was the combination of data such as he had referred to that would really yield the results that were wanted. As regards tuning, variation in the wavelengths, which was one of the methods of removing interference at stations, was not by any means the only way. There was the tuning by means of the musical note, which Prof. Fleming had referred to. The spark-gap was arranged to give a certain number of train of waves per second. Prof. Fleming had said from 400 to 500 was usual for telegraphy, but the note had been worked up to 1,000, and although it penetrated through atmospherics better than the lower notes, it produced a very disagreeable sensation in the ear of the observer, and for that reason operators did not particularly like that note. The directional aerial also helped to reduce interference, but quite recently

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a new arrangement had been adopted by means of "balancing" aerials. One was placed at right angles to the other, and in that way interference was reduced, or, in fact, done away with entirely, so that it was possible to have duplex transmission and reception. If there was time Mr. Pletts, who was one of the chief technical engineers of the Marconi Company, would explain the arrangement. There was also another method. Suppose there were three signals being received, and they only wanted to hear one of them, and do away with the other two. There was an arrangement by means of which the two signals they did not want to hear could be opposed in three receivers, and thus annulled. The third signal, which they did want to hear, was reduced in strength, but it could be heard. As regards the probability of replacing the telephone for receiving, within the last few months a photographic arrangement had been devised, which worked admirably; but a few days ago a new arrangement had been devised, which the Marconi Company thought would replace the photographic arrangement. There was a great objection to a mere photographic record, because it simply recorded everything—the signals that were wanted and those which were not wanted. The human ear could distinguish the signals it wanted to hear, and leave out those which were not wanted, very much in the same way that a bandmaster could hear one instrument and leave all the others out; but photographic arrangements recorded everything. This new arrangement, however, would be such that, whilst it recorded everything, it would also give the advantage of a telephone in a sense, and pick out the signals required.

As to the possibilities for producing a suitable signal to avoid the necessity for the receiving operator constantly listening at the telephone, he thought Prof. Fleming meant by that a matter which was discussed at the International Radiotelegraph Conference in London for calling up ships at sea in cases of distress; the question was a little ambiguous. That arrangement had already been devised, and was working satisfactorily, but so far it had not been applied in practice. Dealing with the question of the localisation of the position of the transmitting station, and the determination of its distance, it was rather difficult to say whether the last word had been said on the Bellini-Tosi radiogoniometer, or, in fact, on any matter referring to wireless telegraphy or anything else; but that particular arrangement could now give bearings to within one or two degrees of accuracy, which was quite as good as one could get from a compass, so that, from the practical point of view, he thought one could say that that was the last word. As regards telephony, the Marconi Company had succeeded at Chelmsford up to a distance of 300 kms. The Marconi Company did not think that wireless telephony had by any means reached its practical limits, but, at the same time, they rather thought that practically it would be a long time before it came into use; in fact, he would almost say that the better it was the worse it would be practically, unless they could tune out all other conversation, because everyone would be using it, and there would be so much noise that they would not be able to hear themselves speak.

The last point was about the committee referred to. Undoubtedly such a committee could do excellent work in many of the directions referred to by Prof. Fleming, as, for instance, in the measurement of received signals. He thought it must be borne in mind that there was a great difference between receiving wireless signals and transmitting them. Receiving apparatus was small, and could be established without difficulty, whereas the transmitting apparatus for long distances required special knowledge and skill. From the commercial point of view—*i.e.*, when working day and night, and without undue repetition, wireless telegraphy, up to a range of 1,000 kms., was quite easy, and the apparatus for that purpose was standardised. The real difficulties began when the ranges were above 2,000 kms. The curve in Fig. 6 illustrated this point. During the day signals dropped right off just about a range of 2,000 kms., and that indicated the reason that great difficulties occurred after a range of 2,000 kms. These difficulties were bound up in the questions asked by Dr. Fleming, and hence, unless this committee could command the use of apparatus for long-distance transmission, and practically had unlimited capital, they could not hope to obtain the data to answer the majority of the questions asked by Prof. Fleming. They would have to have the whole world as a laboratory, and work with all sorts of wave-lengths, and then they would find themselves in conflict with the International Convention, which prescribed certain waves, and also find themselves in opposition to all the different wireless stations all over the world. At the same time, data of this kind was now being collected by the Marconi Company, and in the future would be published.

There is no space to report the discussion which followed, and we must therefore hold over the remainder of the report of this interesting meeting until the next issue of THE MARCONIGRAPH, when we hope to publish some interesting experiments made by Dr. W. H. Eccles and Mr. A. J. Makower, in which spark-gaps immersed in running liquid are used for the production of electrical oscillations.

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## Correspondence

### Daylight Effect on Radiotelegraphic Waves

(*To the Editor.*)

SIR,—After perusing the interesting article on "The Effect of Daylight on Radiotelegraphic Waves," from the pen of Dr. W. H. Eccles in your last number, I take the opportunity, previously neglected, of placing on record that I arranged a series of tests, carefully planned beforehand, to observe the effect, if any, of the solar eclipse of April 17th last on X's at wireless stations. Simultaneous observations were made at the Caister station, at Cullercoats, and at a temporary installation on the outskirts of Birmingham. The observations at Caister were taken by myself, personally, whilst those at Birmingham were taken by a skilled observer (Mr. L. B. Turner, M.A.), and at Cullercoats by the officer-in-charge. Unfortunately I have not got the records by me whilst writing this, but the procedure was to take exact time from the Eiffel Tower time signals and make continuous observations for some time before, during and after the eclipse, noting the precise time and character of each X registered. At Caister, at least, the conditions for making observations (for which the magnetic detector was used in preference to a crystal) were good by reason of the isolated position of the station and its immunity from any effects due to switching on and off electric lights, etc., during the period of semi-obscurity; also for the reason that no secondary disturbances from neighbouring conductors of any magnitude were possible. The results were completely negative. At Caister some few X's of a very faint and unpronounced nature were certainly observed both before, during, and after the eclipse. There were possibly rather more of them during the eclipse, but not sufficient to draw any inferences from. At Birmingham and Cullercoats no X's were recorded on the magnetic detectors. In all three cases the wave-length adjustment of the receiver was of the order of 500-600 metres, the aerials being grounded through the magnetic detectors during the observations.

Too much precaution cannot be taken in tests of this kind to guard against local and secondary disturbances.

Yours, etc., J. E. TAYLOR.

Engineer-in-Chief's Office, G.P.O.,
London, E.C.

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(*To the Editor.*)

SIR,—I have read the article of Dr. Fleming on "The Effect of Daylight upon Radiotelegraphic Waves" in your issue of August, and was particularly interested in the section headed "Conductivity of the Air," as I have been engaged, together with my brother, for some years in carrying out experiments on the electrical state of the atmosphere by means of kites and balloons, and have deduced from these a value for the specific resistance of air, which does not agree very well with the figure $10^{10}$ ohms per centimetre cube as adopted in the article in question.

In one experiment made by us it was found that the current flowing down a steel kite-wire with the kite at a height of 1,400 feet, when the kite-wire was earthed through a resistance of 1,200 megohms, had about one-third of the value that was measured when the kite-wire was directly earthed. This would point to the fact that the total resistance of the air concerned in this circuit was about 600 megohms.

This figure is confirmed by other measurements, of which the following is typical.

A kite was flying at a height of about 1,000 ft., and it was found that when it was directly earthed through a galvanometer, a current of about 20 micro-amperes flowed down the wire. The kite-wire was then insulated from earth at its base, and connected to a Kelvin electrostatic voltmeter, and the potential measured was 20,000 volts.

Assuming that the potential of the air round the kite in these two measurements to be the same, we get by ohm's law a value of 1,000 megohms for the total resistance of the air in circuit.

The two values of 600 megohms and 1,000 megohms are in sufficient agreement for it to be assumed that the total resistance of the air-circuit is of the order of 1,000 megohms.

The specific resistance of the air may now be calculated with the aid of this figure.

Our kites and balloons all had a collecting area of about 150 sq. ft., and so may be taken roughly as spheres of 100 cm. radius. The total resistance of the air may therefore be approximately calculated by integrating from the surface of a sphere of 100 cm. radius to one of infinite radius, and this figure should be 1,000 megohms.

We thus have, if $\rho$ is the specific resistance of air per centimetre cube, and $r$ the radius of the sphere in centimetres

$$\int_{100}^{\infty} \frac{\rho \, dr}{4\pi r^2} = 1000 \times 10^6$$

This gives approximately $\rho = 10^{12}$ instead of the value, $\rho = 10^{10}$ adopted by Dr. Fleming.

It thus appears that there is still no certainty as to the correct value to be given to the conductivity of air, and any results based upon an assumption of a value for this quantity must be considered doubtful until the question of the conductivity of the air has been more definitely settled.

Yours, etc.,

A. J. MAKOWER.

South-Western Polytechnic Institute,

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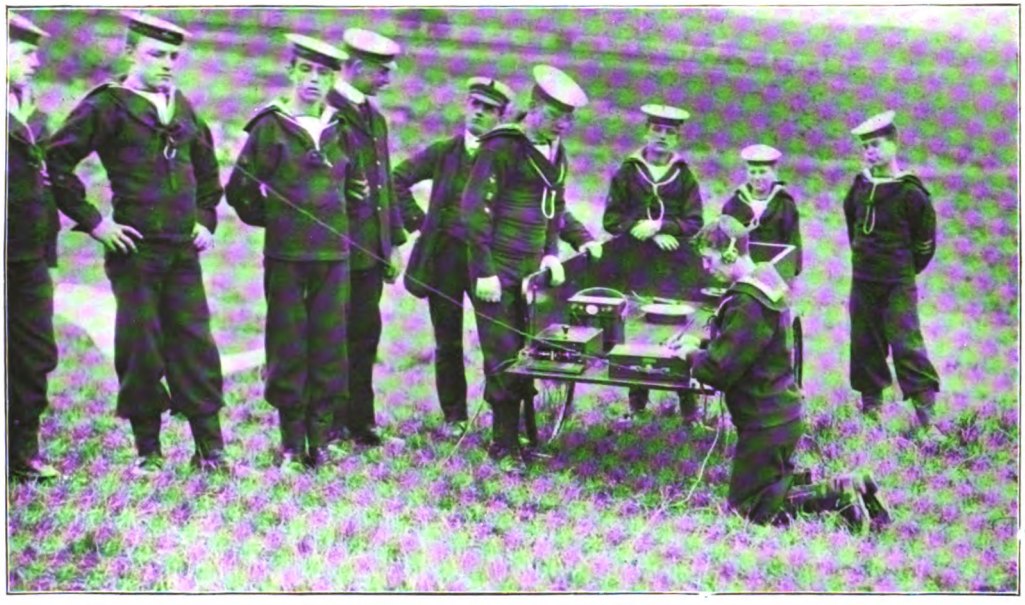
# Wireless Training in Heswall Nautical School

A HOME Office Blue-book gives an interesting account of the work carried on at the Akbar Nautical School, at Heswall, Cheshire. There is, in addition to an excellent wireless equipment, a Marconi portable wireless telegraph apparatus, a lifting kite, and a new wireless mast. Signalling and radiotelegraphy are the *forte* of the school. Day and night watches are kept in the wireless room, and a careful record of all messages received is made. Last year an average of 622 messages—and some of them very long ones—were received weekly. Four boys gained the Postmaster's certificate of proficiency in radiotelegraphy. The boys complete their course of instruction at the Marconi School in Liverpool.

It may interest our readers to know a little more about the wireless training at the Heswall Nautical School, which has been commented upon so favourably in an official document. The portable station shown in the accompanying illustration is of the Marconi type, and was fitted up in camp by the boys this year. During the fortnight's camp constant communication was maintained with the school, and all school business was conducted by wireless. The portable apparatus worked excellently during the whole time, and was specially commended by Capt. E. G. O. Beuttler, the Captain Superintendent of the School.

There are 235 boys at Heswall, and 25 of these receive instruction in wireless telegraphy. They live in bedrooms apart from the other boys, and receive wireless instruction during the whole of the day. "Watch" is maintained in the instrument room throughout the 24 hours, and a log kept of all messages received, which reach the school from stations so far distant as Paris, Germany, Poldhu, and elsewhere.



*Heswall Boys with their Portable Marconi Set.*

The tuition received by the boys at Heswall extends over a period of from two to three years, at the end of which time the pupils sit for the Post Office Examination at Seaforth. There are two class rooms fitted up at the school with modern wireless apparatus, and the power for the main set is supplied by an 80-volt dynamo. The addition of a portable wireless set will still further increase the value of the instruction given to the boys, and it has already proved its advantage. During the

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past summer a sham fight was held between the school and some Liverpool Territorials. The former took out their field guns, also their portable wireless set, and by means of this they were able to communicate the movements of the "enemy" to the school, thus enabling reinforcements to be brought up. The sham fight ended in victory for the Heswall boys, and it is no exaggeration to state that the wireless set contributed largely to this victory.

The wireless instruction at Heswall is given with a highly commendable practical object, and will result in the addition to the *personnel* of the mercantile marine of a highly useful class. In due course the boys will be qualified to take up positions as wireless operators in small cargo boats, and when not engaged in wireless duties they will be able to assist on the bridge or to carry out clerical duties. The time is perhaps not far distant when the demand for men will become very great, and in fitting the boys for such duties Capt. Beuttler and the officials at Heswall are performing a duty of great national importance.

*One of the Heswall Boys at a Masthead attending to Insulators.*

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Addressing the members of the Bradford Post Office Telegraph Messengers Institute, Mr. A. B. Walkley, the Assistant Secretary of the General Post Office, who is well known as the famous dramatic critic, pointed out that the Admiralty, in throwing open a certain number of posts for wireless operators in the Navy to boy labour, had provided a means for diverting the stream of boys drifting into blind-alley occupations.

## The Office Window

UNDER the above heading there appears every morning in the *Daily Chronicle* a column of bright and interesting gossip. The proposed Imperial scheme of wireless telegraphy has prompted the writer of those notes to delve into the early history of the telegraph, with the result that there appeared on August 19th some interesting sidelights upon the history of the subject.

* * *

Wireless telegraphy round the Empire was far beyond the dreams of our grandfathers. Lord Cardwell told Sir Mountstuart Grant Duff that, when he was at the Board of Trade, he thought it right to circularise the other offices about the principles on which telegraphic concessions should be given, calling attention, among other things, to the inconvenience that would arise if the right of communicating with Malta were monopolised by a telegraphic company, which should use it as a stage on the road to India. That afternoon Sir Charles Wood met him at the House, and asked him if he had taken leave of his senses. "Why?" asked Cardwell. "Why? Because you sent us that circular—which contemplated the telegraph being extended to India."

* * *

For centuries before Marconi wireless telegraphy has been known, and the mystery of swift communication has puzzled many civilised explorers of barbarian regions. In the heart of Africa a missionary discovered the method of hollowing a large gourd, which was then dried, and round it was stretched the skin of a kid, hard and thin as parchment. Beaten with a padded drumstick this instrument gives a sound which can be heard eight miles away. And each village contains the expert who can tap the message and send it on.

* * *

That is obviously the origin of the Morse code, which is the dot and dash, the flag wag, the flash and dark of the lantern, and all the systems that depend on the intervals of sight and sound. There are probably many people like myself who seldom go into a post office without noting involuntarily the tap on the telegraphic instrument, and reading off by the sound the intimate message of strangers. I have heard many curious communications at the price of a halfpenny stamp.

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We have received the March-April 1912 Edition of the *Revue de L'Armée Belge*, a bi-monthly publication, which contains the first portion of an article dealing with the Marconi portable wireless telegraph stations. A full account is given of the successful demonstrations with Marconi portable apparatus carried out in Belgium during the early part of this year.

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# East Coast Defence

IT was decided some time ago that a chain of wireless telegraphic stations should be established along the East Coast, and three of these are already erected and in working order. These are situated at Dover, Ipswich, and Grimsby respectively. It has now been decided to add another to this link that is ultimately to extend to the Orkney Islands, and a site for this has just been secured at Stockton. According to a special correspondent of the *Newcastle Chronicle*, it was at first suggested that this station should be based upon the mouth of the Tyne, but after the experts of the Admiralty and the War Office had carefully considered the matter for some time it was decided that the Tees offered better facilities.

### New Wireless Station

The work of building this station is to be taken in hand almost immediately. Like the stations now in existence, it will be controlled jointly by the Admiralty and the War Office, but the cost of its construction will fall upon the first-named body. The site that has been decided upon extends to some seven acres, and preliminary work upon the preparation of the ground is to be commenced immediately. The plant to be erected will be of the most powerful and latest pattern, and not only will it be possible to maintain from this station constant touch with the whole of the fleets operating in the North Sea, but direct communication with the Admiralty buildings in London. It will likewise be possible to maintain communication with the stations at Dover, Ipswich, and Grimsby, as well as with the next northerly station to be constructed, which will be situated on the Firth of Forth, close to the new naval base at Rosyth.

There is at the present time a departmental committee sitting at the War Office to consider recent developments in wireless telegraphy and its better application to military purposes, but it is not proposed to await the publication of the report of this committee before proceeding with the Stockton station, since it will be quite possible to introduce any modification that may be suggested into the installation as its erection goes forward.

The site selected is admirable from every point of view, and is so completely isolated upon all sides that the presence of unauthorised strangers could be immediately detected and steps for their removal instantly taken.

The Stockton station will be entirely self-contained in every respect, the whole of the electric current necessary will be manufactured on the spot, and the whole of the plant will be in duplicate, in order to prevent any break-down through an accident to the machinery. The entire station will be lighted by electricity, and this will be supplied from an independent installation to that which supplies the current for the telegraphic work. When the station is completed it will be manned night and day, and will be made use of almost from the first. The staff, in the first place, will be mainly supplied by trained men of the Wireless Company of the Royal Engineers from Aldershot, with additions from the naval ratings as may be necessary. It will not be possible, however, for any ships of the mercantile marine to use this station for the transmission of messages.

### Its Use to Merchantmen

It is realised, however, that many occasions might arise when merchantmen trading in the North Sea and the Baltic might be able to communicate information of the most vital importance, and it is therefore proposed in due course to erect a subsidiary plant, capable of receiving these messages, and this would be available for general use, as well as for communications it was desired to pass on to the naval authorities. This work, however, is not to be taken in hand in the first place, since, first of all, it is desired to press forward the work of linking up the whole of the East Coast by means of these wireless stations for purely defensive purposes. By the addition of general receiving stations, however, some amount of revenue would accrue that would go to the reduction of the cost of their construction and maintenance. In addition to the wireless plant itself, the new station at Stockton will be very completely equipped with ordinary telegraphic machines, including a special wire to London to be used in conjunction with the wireless apparatus when the occasion demands, as well as long-distance telephones, etc.

There is no intention at the present time of placing any armaments in this station, though in the event of a naval war in the North Sea the place would, of course, be very strongly garrisoned. Quarters are to be built, however, for a detachment of the Royal Garrison Artillery, that will be charged with its protection in time of peace, and this garrison will be drawn from the two companies of Royal Garrison Artillery now maintained at Tynemouth. The Tyne detachment of Electrical Engineers will also be trained here, and advantage of this will probably be taken year by year, in order to afford men willing to qualify as wireless operators for service in time of necessity with the necessary facilities for learning.

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## Ocean Journalism.

THE first ocean newspaper to be published was a little sheet known as the *Trans-Atlantic Times*, which made its appearance on November 15th, 1899, on board the American liner "St. Paul." On this voyage the "St. Paul" carried Mr. Marconi and two of his engineers, returning from America, where they had been carrying on experiments with wireless telegraphy. The particular object of their visit to America had been to report the yacht races for the Associated Press, and, as success had crowned their efforts, they were looking for new worlds to conquer. It was then that they decided to publish a newspaper on board ship, which they were able to do by obtaining the latest news from the Marconi station at the Needles. From this small beginning the idea gradually grew, until the erection of high-power stations at Poldhu and Cape Cod made possible the constant reception of news from land and a daily issue. The *Trans-Atlantic Times* was therefore the progenitor of the daily wireless newspapers which are so important a feature of many liners on the North and South Atlantic routes, and of which there has since been a further development recently in the appearance of the *Cunard Daily Bulletin* in a revised and considerably improved form. A special correspondent of the *Daily Mirror*, who crossed the Atlantic on the "Caronia," sent to his paper the following account of editing in mid-Atlantic. The correspondent's message was sent from lat. 47 N., long. 22.11 W., and reached the *Mirror* office *via* the "Mauretania."

PURSER JOURNALIST.

"We have just published a sixteen-page daily newspaper in the mid-Atlantic, and we feel very proud of it.

"A Cunard purser is a wonderful man, almost as used to dealing with emergencies as a sea scout, but he cannot set up type. When I am not on the 'Caronia' Purser McCubbin is the editor. Even when I am he wants me to do the work, which is a way really capable editors have.

"The manner in which 'Mac,' as everyone calls him, deals editorially with a difficult problem in international diplomacy or decides how much space a murder in New Orleans is worth would shame most London journalists.

"It was nearly one o'clock this morning when the Marconi operator woke us up and handed us a long message. It had been flashed dot, dash, dash, dot, dash, nearly 1,000 miles over the ocean from a room at the Poldhu wireless station which overlooks beautiful Mullion Cove, on the Cornish coast. A wireless operator had been sitting tapping at a desk, and here a few minutes later was the world's news of the night waiting to be edited in the middle of a prairie of tossing waves.

"'Hallo, Jack Johnson's wife has committed suicide!' said the purser. 'We ought to put that at the top of a column.' So we did.

"'That's a terrible affair in Jersey City,' he went on. 'Countess said to have been murdered by a lawyer. We'd better head the paper with that.'

"Then there was the question of how much space to give to the fact that Christabel Pankhurst has been found in Paris, and the problem of deciding whether there would be war in the Balkans or not.

"The purser settled off these as easily as Napoleon would have done.

"PRINTED ON 'B' DECK.

"Upstairs in the Marconi house on the upper deck the operator, Leith, was still taking down more news—the price of De Beers in London when the market closed that afternoon, and the late quotations for December cotton in Liverpool.

"Then upstairs we went with our copy to the printing room on 'B' deck. The wet wind made our hair feel like sodden hay.

"'Be careful,' shouted the purser, 'and hold on to that article on the Maine State election; we don't want it blown overboard, or we shan't go to press to-night.'

"In the printing house forward the printer was setting up the news about Jack Johnson's wife from a frame of loose type. Outside in the darkness was the fury of the wind and the soapsud whiteness of ploughed waters.

"On the port side was a single light. Some liner was on her way to Liverpool. Below nearly 2,000 souls were sleeping, and all the time Marconi's wonderful machines were tapping out more news.

"An hour or so later a Harrild crown folio platen press, driven by a one-horse-power motor, was printing the papers, and at nine this morning a newsboy came to my state-room door with a score of copies in his hand.

"'*Cunard Daily Bulletin*, sir; *Cunard Daily Bulletin*, sir,' he said. 'Twopence halfpenny.'

"That was two hours ago. Now Mr. J. S. Patterson, of Memphis, Tennessee, is reading words of comfort about cotton, for he has got a straddle, which means he has sold October cotton and bought December bales, and is looking for the difference in price to widen.

"Judge O'Neill, too, a staunch Democrat from Scranton, Pennsylvania, is discussing the news of the election in Maine with a banker from Montgomery, Alabama.

"Thanks to Marconi our smokeroom is just like a West End club with a tape machine."

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# Maritime Wireless Telegraphy

AS an illustration of the use of wireless in such emergencies as labour troubles the following incident is of interest. The Aberdeen liner "Gothic" was due to proceed direct to London during the recent Dock Strike, where its reception might not have been cordial. The aid of wireless was called in, and the "Gothic" landed her passengers at Plymouth, whence they proceeded to London by train. The Union Castle liner "Dover Castle" also landed her passengers at Plymouth, and did not call at Southampton.

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An example of the use of wireless telegraphy in regions difficult of access is afforded by the determination to explore the unknown territories of Canada, and for this purpose to erect wireless stations in the far north and west which would be in direct communication with a central bureau at Ottawa. Exploring parties would then report to these stations, and all information of importance be immediately communicated to headquarters. Proposals have been made to erect stations at the following points: Cape Chadleigh, 1,100 miles from Ottawa; Charles Island, 1,170 miles, both on the north of Ungava; at Lake Garryl, 1,700 miles; Borman, on the Mackenzie, 2,300 miles; and Fort Resolution, on the Great Slave Lake, 1,830 miles.

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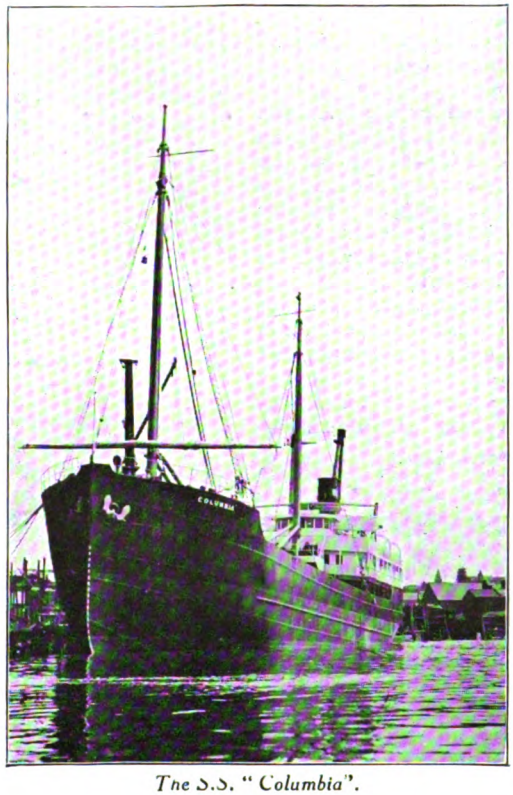
The s.s. "Columbia," shown in the accompanying illustration, has been equipped by the Marconi Wireless Telegraph Company of America with a 2-kw., 240 cycle ship set for the Olsen and Mahoney Company.



*The S.S. "Columbia".*

This month's list of vessels already equipped with wireless apparatus by Marconi's Wireless Telegraph Company is a large one. There are three for the P. & O. Steam Navigation Company—the "Sudan," "Nore," and "Syria," bound for China. Several vessels are destined for America, all passenger boats, the "Bogota" and "Duendes" belonging to the Pacific Steam Navigation Company, and the "Clyde," belonging to the Royal Mail Steam Packet Company; but in this instance only emergency plant has been added to the already existing set. There is, besides, the "Itassuce," now being built for Messrs. Lages at Troon. The Cunard Company have also had their magnificent first-class liner the "Carmania" equipped with wireless, and the Brazilian Government have ordered a 1½-kw. set and emergency plant for the "Guarany," while Messrs. Andrew Weir & Co. have supplemented the existing installation on their cargo steamer "Luceric"—trading between New York and the East—with an emergency set. The Australian Government have had their coasting vessel "West Australia" equipped, as also the Union Castle Mail Steamship Company their luxuriant vessel the "Balmoral Castle," plying between Southampton and South Africa. There are two Indian transports, the "Rewa" and "Rohilla," belonging to the British India Steam Navigation Company, and Messrs. Yeoward Bros. have commissioned the "Ardeola," a passenger vessel visiting the Canaries, to be likewise equipped. All of these vessels, excepting in the case especially mentioned,

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are provided with a 1½-kw. set and an emergency plant. Of the vessels with equipment yet to be completed, there are destined for American shipping the trader "Huanaco," belonging to the Pacific Steam Navigation Company, and the "Druba," of the Royal Mail Steam Packet Company, whose existing apparatus will be supplemented with emergency plant, while another boat belonging to this line, the "Desna," will be fitted with the full 1½-kw. set and emergency plant. Two Australian vessels will be fitted up—the "Indrapura," of the Australasian United Steam Navigation Company and the Indra Line respectively; and the Far Eastern service is represented by the "Simla" and "Nile," of the P. & O. Steam Navigation Company, the "Drumcree," belonging to Messrs. Chadwick & Sons, and the P. & O. transport ship "Dongola." The Plant Line have commissioned the equipment of the "Evangeline," which is now building at Glasgow, destined for the Canadian route, while the "Dakar," of Messrs. Elder Dempster, is for the Gold Coast. As in the case of the vessels already equipped, each is to be installed with 1½-kw. and emergency plants; the "Agadir" alone, belonging to the Royal Mail Steam Packet Company, and destined for Moroccan trade, is supplied with a 1½-kw. set and emergency plant; this is a set especially designed for use on cargo vessels where space is of importance, and although not possessing the same advantages of wave-length as the stronger equipment, it is entirely adequate for short-distance communication and all life-saving purposes.

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The Compagnie de Télégraphie Sans Fil, of Brussels, have recently received instructions for the equipment with Marconi apparatus of a number of important vessels for Continental owners. Among these are three Swedish steamers, belonging to the Rederiaktiebolaget Lulea Ofoten, of Stockholm, with 1½-kw. sets and emergency gear. These ships are now being built—two in Newcastle-on-Tyne and one in Gothenburg. They will be engaged in the iron ore trade, and will sail between Narvik in the north of Norway and Rotterdam, and will occasionally have to cross the Atlantic. The two steamers building at Newcastle will be ready for the end of this year, and the one in building at Gothenburg at the end of January.

The Compagnie de Télégraphie Sans Fil are at present fitting in Spain eight steamers of the Islena Maritima (of Palma de Mallorca, Baleares), four with 1½-kw. sets, the s.s. "Rey Jaime I," "Rey Jaime II," "Miramar," and "Bellver," and four with ½-kw. cargo sets, the s.s. "Luleo," "Cataluna," "Balear," and "Isleno." They are also starting the fitting with ½-kw. sets of four vessels for the La Maritima, Compania Mahonesa de Vapores, Mahon, Baleares—the s.s. "Mahon," "Monte Toro," "Isla de Menorca," and "Menorquin." They will further have to fit with the 1½-kw. set and emergency gear four steamers of the Sociedad de Navegacion é Industria, Barcelona—the s.s. "Hesperides," "Delfin," "Atlante," and "Reina Victoria."

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In Holland the same company have orders for fitting seventeen cargo boats of the Stoomvaart Maatschappij Nederland—the s.s. "Krakatau," "Sumatra," "Lombok," "Celebes," "Kangean," "Karimata," "Nias," "Kambangan," "Billiton," "Boeton," "Batjan," "Riouw," "Rotti," "Radja," "Karimoen," and two unnamed, and eleven boats of the Rotterdamsche Lloyd—the s.s. "Medan," "Menado," "Gorontalo," "Bandoeng," "Merauke," "Pontianak," "Samarinda," "Madioen," "Socrakarta," "Ternate," and "Palembang," of which several are already fitted. They have also fitted four boats of the K.W.I.M. with 1½-kw. sets and emergency gear—the s.s. "Prins der Nederlanden," "Prins Fredrik Hendrik," "Oranje Nassau," "Prins Maurits," and will very soon have to fit five steamers of the Koninklijke Paketvaart Maatschappij—the s.s. "Tasman," "Van Lansberghe," "Rumphius," "Melchior Treub," and another vessel not yet named.

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The remarkable extension of commerce and the strengthening of the Imperial bond between the Mother Country and the Colonies in the Antipodes is in no small measure due to the genius and enterprise of such shipping lines as the White Star. It was on the great ocean route to the far-off distant islands that the fortunes of the White Star Line were established by the acquisition, about the middle of last century, of a line of Australian clippers which were subsequently succeeded by steam tonnage. The history of this trade has been one of continuous development. The White Star Line have under construction, by Messrs. Harland & Woolf, Ltd., of Belfast, a vessel for their Australian service, via the Cape, which is far in advance of the fine steamers at present trading on the route. The new vessel will be known as the "Ceramic," and her gross tonnage will exceed 18,000—that is to say, she will be half as large again as the present White Star steamers. She will have accommodation for a large number of passengers, and several capacious refrigerating holds for fruit, meats, and other Australian products, as well as a large capacity for general cargo. A Marconi wireless set will form part of the equipment of the "Ceramic."

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# The Compulsory Equipment of Ships

## An Example from the United States

THE Wireless Ship Act which came into operation in the United States on July 1st, 1911, seems to have worked very smoothly. A full year had been given to allow ocean passenger steamships to get ready for it. The result was that there was ample time in which to provide the necessary equipment. In addition, there was general willingness to comply with the new law. In his annual report, the Commissioner of Navigation points out that at the present time 488 ocean passenger steamships departing from United States ports are equipped with wireless, compared with 370 such vessels before the Act took effect. The commissioner does not ascribe this increase as being wholly due to the law, but rather to the appreciation by owners of the economies in dispatch, in securing pilots and loading berths possible by the use of wireless. Moreover, the demands of the public travelling by sea on small steamers have impelled owners to equip their vessels with wireless telegraph apparatus. The commissioner proceeds to discuss the general effect of the new Act.

### Mutual Usefulness of Wireless

The efficiency of wireless apparatus, he states, and the skill of operators on shipboard concerns the wireless company which leases the apparatus and furnishes the operator, and also concerns the owner and master of the vessel. To the inquiry, then, whether Government supervision is needed in addition to that prompted by self-interest, the commissioner replies " that it has been deemed necessary as well as humane both here and abroad to provide for Government inspection of the hulls, boilers, machinery, and equipment of vessels, and to examine the qualifications of their officers in the interest of the safety of life of those on board. The same reasons prompt Federal inspection of wireless apparatus." There are other reasons, however. The seaworthiness of a vessel, in the main, concerns only those on board that particular vessel. Sound boilers and adequate pumps protect the lives on board the ship equipped with them. Efficient wireless apparatus and skilled operators not only protect the lives of passengers on board ships where they are employed, but insure prompt aid in peril to those on board of other steamships. The commissioner considers that the mutual usefulness of wireless apparatus in time of danger to two or more steamships or to a shore station affords a special reason for Government inspection. In fact, the general equipment of ocean passenger steamships with wireless apparatus takes its place, and at insignificant cost to the Government, among the several services which Congress maintains with liberal appropriations for the safety of life and property on the water.

In another part of his report the Commissioner of Navigation notes that there have been only three cases in which non-compliance has been alleged, and that these are awaiting the decision of the courts. One case was that of the American mail steamship " Zulia," which cleared from Mayaguez, Porto Rico, for New York, with a crew of 53 men and 31 passengers. The parts of the wireless apparatus were on board, but had not been put together, and there was no operator. The plea of the owners was that they did not suppose that Mayaguez was a port of the United States, and that they intended to put the apparatus in commission at New York. They were asked to give a bond or £1,000, the maximum penalty.

### How the Rules Work

In the case of another American steamship, the " Lexington," the alleged infraction of the law arose in a curious way. At Savannah, a port of call, the wireless operator left the ship for a " trolley trip " of a few hours, and when he returned to the wharf the ship had sailed for Philadephia. His absence was not discovered until the vessel was well down the river. The case, says Mr. Chamberlain, had its effect, as in another instance an American steamship, discovering when the vessel was ten miles out at sea that the operator was not on board, promptly returned to port. The third case is that of the British steamship " Templemore," a cargo boat not equipped for wireless. She, it is alleged, cleared from Baltimore for Liverpool with a crew, nominally, of 75 men. These apparently included four well-known residents of Baltimore, not connected, so it is said, with either the ship or her cargo, who were entered on the ship's articles at a shilling a month. The master was advised that he would carry such men at his own risk, and the question whether there was an infringement of

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the law remains to be determined. It is stated that in several cases where the crew and passengers numbered 50 or more, and the ship was not equipped for wireless, the excess over 49 were compelled to go ashore and take another vessel.

An interesting section of the report is that in which the qualifications of operators are discussed. In the opinion of the commissioner the simplest and most thorough method of securing the employment of skilled operators is to provide for Government examinations and the issue of Government certificates of skill in radio-communication, similar to the licences issued to the masters, mates and pilots of steamboats. The Berlin Radiotelegraphic Convention of 1906 provides in the service regulations (VI, 3, 4) as follows:

3. The service of the station on shipboard shall be carried on by a telegraph operator holding a certificate issued by the Government to which the vessel is subject. Such certificate shall attest the professional efficiency of the operator as regards:

(*a*) Adjustment of the apparatus;

(*b*) Transmission and acoustic reception at the rate of not less than twenty words a minute;

(*c*) Knowledge of the regulations governing the exchange of wireless telegraph correspondence.

4. The certificate shall furthermore state that the Government has bound the operator to secrecy with regard to the correspondence.

**Operator's Certificates**

As more than half of the ocean passenger steamers subject to the Act are under flags other than that of the United States, the Department of Commerce and Labour notified foreign Governments and collectors of customs that wireless operators holding valid certificates issued by foreign Governments which had ratified the Berlin Convention would be recognised as persons skilled in the use of wireless apparatus, unless in specific cases there should be good reason to doubt the operator's skill and reliability. The foreign Governments concerned readily adjusted themselves to this arrangement Those nations which had not hitherto issued certificates to skilled operators arranged for their own Government examinations —usually by their naval officers—and issued the necessary certificates. France, Italy and Holland, with others, followed this course; Great Britain had already issued such certificates. So far as foreign ships are concerned, this regulation of the department has worked satisfactorily.

The Berlin requirements were adopted substantially as the test of skill for American operators. The use of apparatus and the employment of operators under the Berlin Convention is voluntary; the Act of June 24th, 1910, made both obligatory under heavy penalty in the case of certain ocean passenger steamers. At the outset, accordingly, it seemed best to require a speed of 15 words American Morse or 12 words Continental Morse in receiving and transmitting messages. By July, 1912, the speed requirement was increased to the Berlin standard. The Continental or International Morse Code is used generally by foreign operators, and is prescribed by the Berlin Convention. It is also prescribed by the wireless regulations of the United States Navy. Experts are disposed to regard messages thus transmitted as less liable to error than by the American Morse Code, which is preferred by American operators generally because it permits of more rapid transmission. The department's regulations, accordingly, permit the examination of operators in either code. In another year it is expected that American ship operators generally will have become proficient in the Continental Morse so as to take or receive messages in that code at the rate of 20 words a minute, five letters to the word.

**Projected Legislation**

To try to carry out so far as possible in the United States the purposes of the Berlin Convention, the Department of Commerce and Labour, in conjunction with the Treasury Department, the War Department and the Navy Department, prepared a Bill to regulate radio-communication. This Bill was introduced in the Senate on March 17th, 1910. It was discussed at length before the Senate Committee on Commerce and passed the Senate unanimously on June 16th, 1910. A similar Bill was reported to the House of Representatives on April 1st, 1910, but was held over for the Senate Bill, which did not reach the House in time for action before final adjournment on June 25th, 1910. The Bills were accompanied by reports from committees which set forth the provisions and purpose of the Bill. The Bill provides, in brief, for Federal licences for the operation of wireless apparatus at ship or shore stations and for Federal licences for wireless operators. The President is authorised to establish regulations to prevent interference with messages relating to vessels in distress or of naval or military stations, and severe penalties are imposed for uttering false or fraudulent distress calls and messages. Distress messages and naval and military messages have priority. The general administration of the Bill is intrusted to the Secretary of Commerce and Labour, and the measure itself is carefully drawn within the commerce clause of the Constitution. The commissioner hopes that the Bill may be passed at the coming session of Congress, as six months' notice should be given before enforcement.

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# Wireless for Boy Scouts

THERE are few who will gainsay the great social importance of a movement such as the Boy Scouts, and those who have given time, goodwill, and money, deserve the thanks of the community for their timely aid, because the movement should, if coming events cast their shadows before, result in a complete change for the better of social and—it must follow—economic ideas, especially from the standpoint of the masses.

*Major J. E. Cochrane giving instruction to Boy Scouts*

Scouts and scout masters are well in front of their watchword. They have let no opportunity for the betterment of their service go by, and a good instance of their determination to make the most of opportunities is their attitude towards wireless telegraphy. They have realised its advantages for their scouts, and are well aware that this means of signalling will supersede the laborious and uncertain semaphore and other methods of eye signalling.

Captain Walter Masterman and Mr. Godfrey C. Isaacs, managing director of Marconi's Wireless Telegraph Co., Ltd., have conjointly presented a complete portable knapsack station to the British Boy Scouts Organisation. This station was designed particularly for employment by scouts, for it is extremely portable and easy of manipulation. The distance over which the apparatus will work ranges from five to seven miles, and the instrument cases are so arranged that when once the adjustments have been made they may be closed, and the station worked without difficulty, whatever climatic conditions may prevail. As regards its portability, the station can be divided either into four loads of approximately 20 lbs. each, or eight loads of 11 lbs. each, and the units of which it is composed are so shaped that they can be conveniently carried in any ordinary haversack or valise.

The introduction of practical wireless to the Boy Scouts was made recently on Tooting Common, when the proceedings were watched by a large number of spectators. About one hundred and fifty Boy Scouts were present, and Major J. E. Cochrane, of the Marconi staff, gave them a practical demonstration of the working of the instruments. First, the transmission and receiving stations were erected some considerable distance from each other, and the boys were shown how to fix the aerials, lay the earth sheets, and test the appliances.

*Scout Offergeld sending messages to another party some distance away*

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When all preliminaries were satisfactorily completed, communication was inaugurated between the two stations, and each patrol in turn received a practical lesson in the forwarding and receiving of messages. The boys showed remarkable aptness, considering that this was the first time they had practised with a real set, and they readily appreciated the advantages of such an aid to scouting ; for by means of a station like this scouts could in wartime direct gun-fire, and communicate with the main body of the army, while the erection of the station would occupy not more than ten minutes in the hands of experienced lads.

But, great as is the enthusiasm for wireless scouting which has been aroused by the presentation of the set already mentioned, an even greater impetus has been given to the boys to obtain proficiency in the art by the offer of Marconi's Wireless Telegraph Company to present a complete wireless outfit to that troop of Boy Scouts which shall provide the first scout able to pass the examination of a second-class operator.

*The Stockwell Wireless Section of the British Boy Scouts*

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To ensure efficient and reliable wireless telegraph communication between H.M. ships of war and ships of the British Mercantile Marine when required, periodical practices will take place from October 1st, at 8.30 a.m. and 2.30 p.m. daily, when any single man-of-war or one man-of-war in a fleet in company detailed by the senior naval officer present will make the call CCCC, followed by her own commercial call sign, indicating that she is prepared to carry out an exercise with any British merchant ship within range. On a British merchant ship receiving this call she will answer and say whether she is prepared to proceed with the exercise.

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On the ground at the back of Government House, Aldershot, the three Telegraph Companies, with a small detachment from the Balloon Company of the London District R.E., have encamped for their annual summer training. The companies are practically at full strength, nearly four hundred being under canvas, and, with one or two exceptions, all for the full term of fifteen days. Major H. E. Leaf, A.M.Inst.C.E., is Camp Commandant, with Capt. H. Lee-Wright as adjutant. Capt. S. W. Humphrey, A.M.Inst.E.E., is with the Wireless Company in command, Capt. M. McC. Bidder is in charge of the Air-Line Company, and Major J. J. F. O'Shaughnessy, M.Inst.E.E., is in command of the Cable Company.

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## Movements of Engineers

H. B. T. Childs is temporarily attached to the Canadian Marconi Co., superintending the erection of steel masts at Louisburgh, Cape Breton.

R. R. Cooke has completed his foreign service leave, after superintending the erection of Marconi stations in India for the Indian Telegraph Department, and is now attached to the Head Office Engineering Staff in connection with the Imperial chain of wireless stations.

S. T. Dockray, C. H. Keith, and R. H. Strickland have arrived at Valparaiso to commence the construction of two 200 H.P. and several smaller stations for the Chilian Government.

P. Eisler has completed the inspection of the Marconi stations in the Canary Islands, and has returned to the head office of the Compania Nacional de Telegrafia sin Hilos, in Madrid.

C. James is at Accra, West Africa, superintending the construction of a wireless telegraph station for the Crown Agents for the Colonies.

S. F. Kos, having completed his leave after foreign service, superintending the erection of wireless telegraph stations at Balik Papan and Tarakan for the Bataffsche Petroleum Maatschappy, has taken up duty in the Head Office.

J. J. Leary, having completed reconstruction of Poldhu station, is inspecting the balance of material for shipment to Chili in connection with the company's contract with the Chilian Government for two large and several small stations, of which work he will be in charge.

J. D. White has taken over charge of Poldhu station in place of Mr. Leary.

E. S. D. Marden has returned from Teneriffe, and is now on leave.

H. McCullough and S. L. Dashwood have completed their foreign service leave after work in India, and are temporarily attached to the Poldhu station.

R. K. Rice has returned from Colombo, after completing the erection of a 5-kw. station at that place, and is now temporarily attached to the Head Office Engineering Staff.

H. J. Round has returned from foreign service leave, after completing the work of inspecting and overhauling the 140 H.P. stations built by the company in Brazil in 1908 for the Madeira-Mamore Railway Co., and has now gone to Coltano, Italy, on special work.

A. G. Savill has completed overhauling Varna station, and is now at Rome making the final test of the new Rome station with Poldhu.

R. N. Vyvyan has returned from Norway, having selected the sites for the Norwegian Transatlantic stations, and has resumed duty as superintending engineer for the Imperial Scheme of Wireless Telegraph Stations.

D. Paton has been selected for duty in Chili, and will probably take charge of the Government school at Valparaiso.

## Movements of Operators

F. J. Lovatt, from the Liverpool School to the "Cestrian."

G. N. McCormack, from the "Munster" to the "Connaught."

W. Raw, from the "Burutu" to the "Empress of Britain."

J. O'Sullivan, from the Liverpool School to the "Empress of Britain."

W. H. Lithgow, from the Liverpool School to the "Hermione."

A. F. Jamieson, from the "Ortega" to the "Haverford."

J. D. Lovelock, from the Liverpool School to the "Haverford."

H. J. Lightfoot, from the "Antony" to the "Manco."

F. N. Calver, from the "Oropesa" to the "Antony."

E. Erbach, from the Liverpool School to the "Arabic."

J. Ralphs, from the Liverpool School to the "Bohemian."

V. F. Evans, from the "Arabic" to the "Burutu."

J. G. Crawford, from the "Bohemian" to the "Canada."

H. W. Rice, from the "Canada" to the "Cestrian."

S. W. Brown, from the "Gloucestershire" to the "Deseado."

F. James, from the "Farquah" to the "Duendes."

R. V. McCreath, from the "La Marguerite" to the "Hubert."

T. Evans, from the "Persic" to the "Arabic."

L. A. Hancock, from the "Armenian" to the "Tunisian."

T. Evans, from the "Arabic" to the "Canopic."

M. A. Preston, from the "Canopic" to the "Arabic."

H. O. Wilson, from the "Ortega" to the "California" (P.S.N.).

H. Munroe, from the "California" (P.S.N.) to the "Ortega."

H. C. Sequeira, from the "Empress Queen" to the "Armenian."

P. O'Keefe, from the Liverpool School to the "Baltic."

J. G. Wasley, from the "Winifredian" to the "Campania."

W. C. Obey, from the "Campania" to the "Carpathia."

G. Arrowsmith, from the Liverpool School to the "Mauretania."

R. W. Renshaw, from the Liverpool School to the "Merion."

S. C. Howes, from the "Carpathia" to the "Munster."

T. G. Threlkeld, from the "Merion" to the "Oropesa."

F. W. Garwood, from the "Ambrose" to the "Persic."

F. R. V. Vick, from the Liverpool School to the "Cameronia."

A. Matthews, from the Liverpool School to the "Athenia."

D. H. Sinclair, from the London School to the "Ausonia."

A. S. Rawlings, from the "Commonwealth" to the "Nile."

G. K. Barber, from the "Sardinian" to the "Agadir."

L. W. G. Alford, from the "Vauban" to the "Agadir."

R. F. Osborn, from the "Californian" to the "Themistocles."

Wm. Crabb, from the "Montrose" to the "Tainier."

J. R. Bamford, from the "Tunisian" to the "Guarany."

C. C. Goulding, from the "Galician" to the "Marmora."

W. Groves, from the "Zealandic" to the "Otway."

P. B. Martin, from the "Scotian" to the "Mount Temple."

H. J. Gallagher, from the "Success" to the "Persia."

H. T. Sayer, from the "Minneapolis" to the "Galway Castle."

G. Balding, from the "Galway Castle" to the "Galician."

G. Walters, from the "Maloja" to the "Moldavia."

C. H. Whitaker, from the "Vauban" to the "Sicilian."

A. E. Bright, from the "Majestic" to the "Volturna."

W. A. Needs, from the "Galeka" to the "Dover Castle."

C. S. C. Nixon, from the London School to the "Dongola."

W. W. Ward, from the London School to the "Danube."

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R. J. Thompson, from the "Sicilian" to the "Wilcannia."

V. W. Ball, from the "Dover Castle" to the "Corinthian."

R. V. Patrick, from the "Briton" to the "Kenilworth Castle."

H. A. Whitmore, from the "Araguaya" to the "Amazon."

S. D. Sloggett, from the "Asturias" to the "Araguaya."

T. G. Petersen, from the "Arlanza" to the "Aragon."

C. T. Sanders, from the "Amazon" to the "Arlanza."

E. H. King, from the London School to the "Araguaya."

F. J. Henderson, from the "Rotorua" to the "Syria."

W. J. Hicks, from the "Saturnia" to the "Intaba."

A. C. Williams, from the "Otway" to the "Intaba."

## Marconi Athletic Club, London.

The opening match of the football season took place at the club's ground, Acton Town, on Saturday, September 14th, when Cadogan were the visiting team, and an exciting game resulted in a win for the home club. In the initial half the play was very fast and interesting, only one goal being scored, and it was obtained by the homesters. After the change of ends, Sharpley, the Marconi centre forward, scored a fine goal, running through the defence in great style. The third goal was obtained from a free kick. Just before the final whistle went the visitors scored their only goal, and a very enjoyable game ended with a win of 3—1 in favour of the home club.

Matches have been arranged with Shakespeare Athletic and Ealing Y.M.C.A. for A. Team, and West End F.C. and Rathleigh for B. Team during September. On October 5th a concert will be held at the George Hotel, Strand, in connection with the football section of the Athletic Club.

## Marconi Athletic and Cycling Club, Chelmsford.

Since last month's notes appeared the local athletic event of the season has been held, with somewhat indifferent results so far as the athletes of Marconi's are concerned.

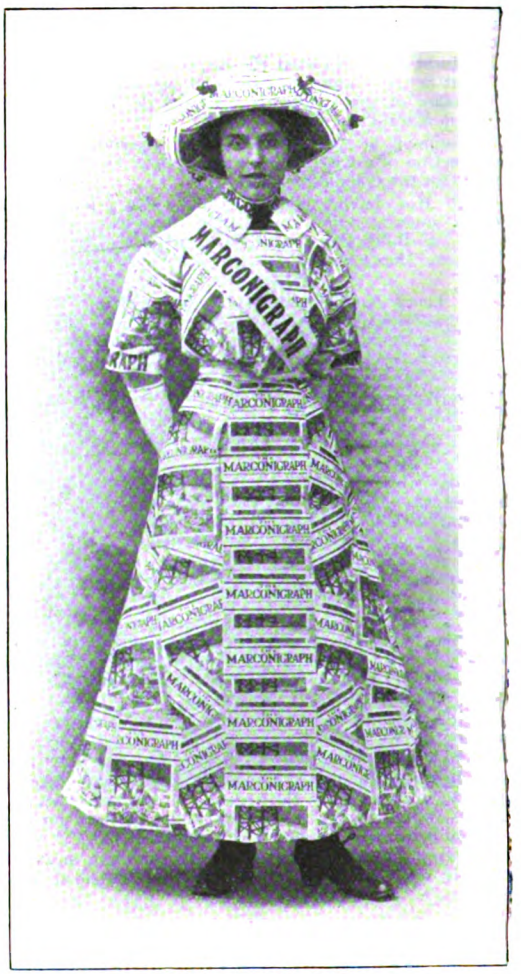
The Chelmsford United Works Sports were held on the Wood Street ground, on August 31st, with Mr. C. Mitchell (Marconi's) as president. The competing firms were: Arc Works, Christy's, Hoffmann's, Marconi's, and the National Steam Car Co. Some very good racing was witnessed, the times, particularly in the sprints, being quite fast. The most notable performance of the day was that by E. H. Barnes (Arc Works), who won the Quarter Mile Flat Championship, the Half-Mile Flat Handicap, and the One Mile Flat Handicap, both the latter being from scratch.

In the totals for the day, Hoffmann's competitors were placed 18 times; Arc Works, 17; Marconi's, 7; National Steam Car Co., 4; and Christy's, 1. Mr. T. Wenden was the most successful competitor for Marconi's; he obtained seconds in the 100 Yards Handicap, the 120 Yards Hurdle Handicap, and the 220 Yards Flat Handicap. In each case he was beaten by inches only.

The principal cause of the comparatively poor show of the Marconi Club was lack of training, due to extreme pressure at the works. Had the athletes been as fit as those of other clubs it is confidently expected that a much better result would have been recorded in this report.

At the Fancy Dress Carnival in the evening the Marconi Club fared much better, as Miss Ward, costumed in MARCONIGRAPH covers, obtained firsts in both the Fancy Dress for Ladies and Decorated Cycles for Ladies. Mr. D. King also took a first for Decorated Cycles for Gentlemen as a wireless telegraph station. In addition to the above, the club gained one first and three seconds in other classes.

September 7th saw the opening of the football season. The first team visited the Arc Works ground in quest of North Essex League points, and obtained a mild revenge for the beating received at the athletic meeting, in this case taking the two points with a comfortable win of four goals to nil. The second team were victorious in their first match, beating the Army Service Corps by two goals to nil.




*Miss J. E. Ward who obtained Two First Prizes.*

On September 14th the first team visited Heybridge, and, to the astonishment of the town, soundly trounced the home team by five goals to one, thus obtaining a further brace of North Essex League points. The second team made a highly creditable draw with Baddow Albion. The club is looking forward to the visit of the Marconi House Club.

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THE MARCONIGRAPH

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# The Training of Operators

WIRELESS telegraphy has become as indispensable to ships for communication as the ordinary land line telegraphs are to the working of our railway systems, and as no railway station or signal-box is without its telegraph instruments, so it is safe to predict that in the near future no ship will be without its wireless telegraph installation. This business has created a new type of telegraphist, known as the "Marconi operator." At the present time there are several hundreds of these operators, with a growing demand for skilled men.

The problem to be faced is that of coping with this demand. The occupation is one which should appeal strongly to young men of fair general education and good penmanship, who, in the ordinary way, might drift into offices and finish up their lives as clerks. To facilitate the entry into this occupation Marconi's Wireless Telegraph Company has decided to inaugurate evening classes at the Marconi House, Strand, London, for training men to take charge of wireless installations on board ship.

Prospective students should not be under nineteen or over twenty-four years of age. After enrolment as a student the beginner will be taught to transmit and receive signals by means of the Morse sounder, buzzer and telephones. He will then follow a course in elementary magnetism and electricity, and when he is sufficiently versed in this theoretical knowledge he will be taught the practical use of the various pieces and types of apparatus employed in installations. This instruction will enable him to connect up the various parts which comprise the wireless set, to trace and remove faults, and repair breakdowns. Finally, he will receive instruction in the various rules and regulations laid down by the Radio-telegraphic Convention for the commercial working of wireless telegraphy, and all clerical work in connection with telegraphic accounts and returns. When this curriculum has been gone through—and, despite the formidable list of work to be done, the course need not last much over six months—the student should be qualified to pass the necessary examination enabling him to take up his duties as wireless operator on board ship. On his appointment to a post he will be required to sign on the ship's articles as a member of the crew—generally with the honorary rank of junior officer—and he will also be expected to observe the disciplinary regulations of the ship, but he will have no more duties than such as are peculiar to wireless telegraphy.

On joining the Marconi classes the student will be expected to pay a weekly fee, but as soon as he has attained the required standard of proficiency and entered the service in his capacity as operator the total fee will be refunded.

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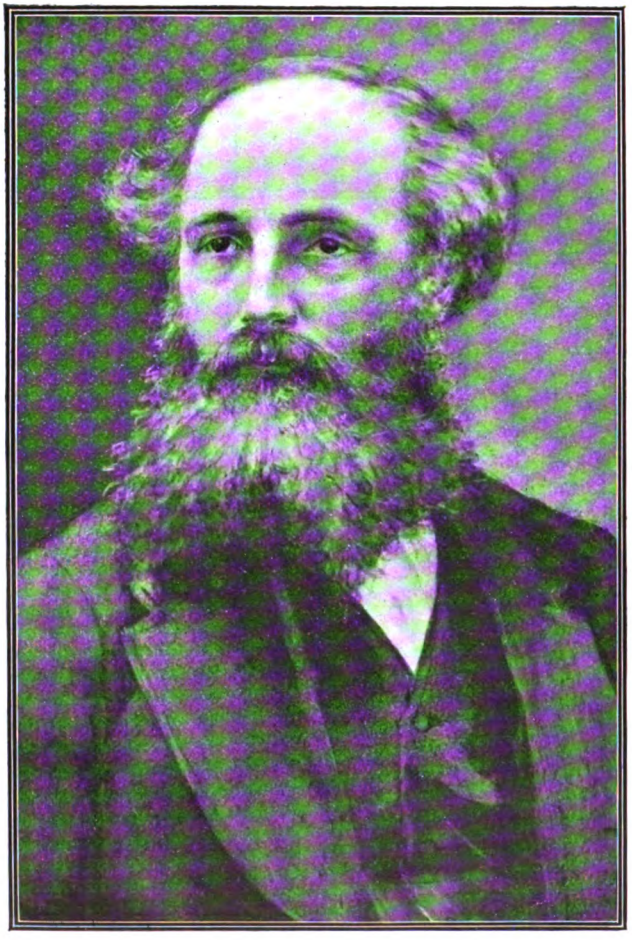

PROFESSOR JAMES CLERK MAXWELL

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# Professor James Clerk Maxwell

THROUGHOUT the study of the scientific theory of wireless telegraphy there live and move the images of three men—Faraday, Maxwell and Hertz—each of whom has added an important quota to the sum of research work that has made possible the brilliant practical results of the present day. Of these, Clerk Maxwell stands in a direct relationship to the other eminent scientists, for it was he who translated the ideas of Faraday into the succinct and expressive notation of the mathematicians, and it was he who established the fundamental laws of motion and electro-magnetic waves of which it was reserved for Hertz to give to the world an experimental proof of their reality.

The last representative of the younger branch of a well-known Scottish family, James Clerk Maxwell was born in Edinburgh on November 13th, 1831. He was educated in his native city and entered Cambridge in 1850. Four years later he took his degree as Second Wrangler, and was declared equal with the Senior Wrangler of his year in the highest ordeal of the Smith's prize examination. In 1856 he was appointed to the chair of Natural Philosophy in Marischal College, Aberdeen, and held that post till 1860. For eight years subsequently he held the chair of Physics and Astronomy in King's College, London, but resigned in 1868 and retired to his estate in Scotland. He was summoned from his seclusion in 1871 to become first holder of the newly-founded professorship of Experimental Physics in Cambridge, and it was under his direction that the plans of the Cavendish Laboratory were prepared. He superintended every step of the progress of the building and of the purchase of the very valuable collection of apparatus with which it was equipped at the expense of its munificent founder, the seventh Duke of Devonshire (Chancellor of the University). He died at Cambridge on November 5th, 1879.

For more than half of his brief life he held a prominent position in the very foremost ranks of natural philosophers. We cannot outline here the noteworthy achievements which stand to the credit of Maxwell, but mention might be made of a contribution on "The Equilibrium of Elastic Solids" which he made to the Transactions of the Royal Society of Edinburgh when only eighteen years of age. That contribution is remarkable not only on account of its intrinsic power and the youth of its author, but also because in it he laid the foundation of one of the most singular discoveries of his later life—the temporary double refraction produced by viscuous shearing stress. In his elaborate memoir on Faraday's "Lines of Force" he gave the first indications of some of those extraordinary electrical investigations which culminated in the greatest work of his life.

In 1873 his great treatise on "Electricity and Magnetism" made its appearance. This work is one of the most splendid monuments ever raised by the genius of a single individual. The author modestly regarded this work as being principally for the assistance of understanding Faraday's mode of thought. It was full of new discoveries, but we are chiefly concerned with only one of these. Clerk Maxwell formulated the hypothesis that the electro-magnetic strains in the medium travelled at a definite speed, depending upon the permeability of the specific inductive capacity of the medium. He showed, however, that in air this speed was the same as that of light, which led him to suppose that light was an electro-magnetic wave probably due to electric vibrations taking place over the surfaces of masses of molecular dimensions. Within twenty-five years from the publication of Maxwell's treatise Heinrich Hertz gave a complete demonstration of electro-magnetic waves and paved the way to the discoveries in wireless telegraphy which have led to achievements that are to-day almost commonplace by their frequency.

Maxwell's contributions to scientific societies began in his fifteenth year and continued over a long period. He obtained in 1859 the Adams Prize in Cambridge for an original essay on "The Stability of Saturn's Rings." From 1855 to 1872 he published at intervals a series of valuable investigations connected with the perception of colour and colour-blindness, for the earlier of which he received the Romford Medal from the Royal Society in 1860. He wrote an admirable text-book on the theory of heat in 1871, and an excellent elementary treatise on matter and motion five years later. One of Maxwell's last contributions to science was the editing of the "Electrical Researches" of the Hon. Henry Cavendish. According to a biographer, Clerk Maxwell was in private life one of the most lovable of men. Though perfectly free of any trace of envy or ill-will, he yet showed on fit occasions his contempt for that pseudo-science which seeks for the applause of the ignorant by professing to reduce the whole universe to a fortuitous sequence of events.

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# Some Observations on the Strength of Signals and X's

By H. J. Round

IN view of the attention which is now being given to the question of the transmission of electric waves over great distances on the earth's surface, it may be of interest to record here some observations taken over an extended period. Owing to the requirements of commercial service, it has often been impossible to observe the various phenomena sufficiently frequently to make certain that they were of constant occurrence. In July, 1911, Mr. Tremellen and the writer succeeded in obtaining at Chelmsford some fairly accurate observations on the variations of the strength of signals from Clifden. An extremely sensitive method of measurement was devised which gave readings proportional to the R.M.S. value of the current in the receiving aerial, provided the musical note and decrement of the transmitter remained constant during the tests. The receiving aerial consisted of a T aerial of average ship size and height; the method used consisted actually in the measurement of the maximum voltage across the secondary of the receiving transformer by means of a Fleming valve, and during the test it occurred to us to obtain some curves of strays or X's. The apparatus enabled us to obtain some sifting of the X's, so that we could either get all the atmospherics or only those whose maximum voltage was above any given figure.

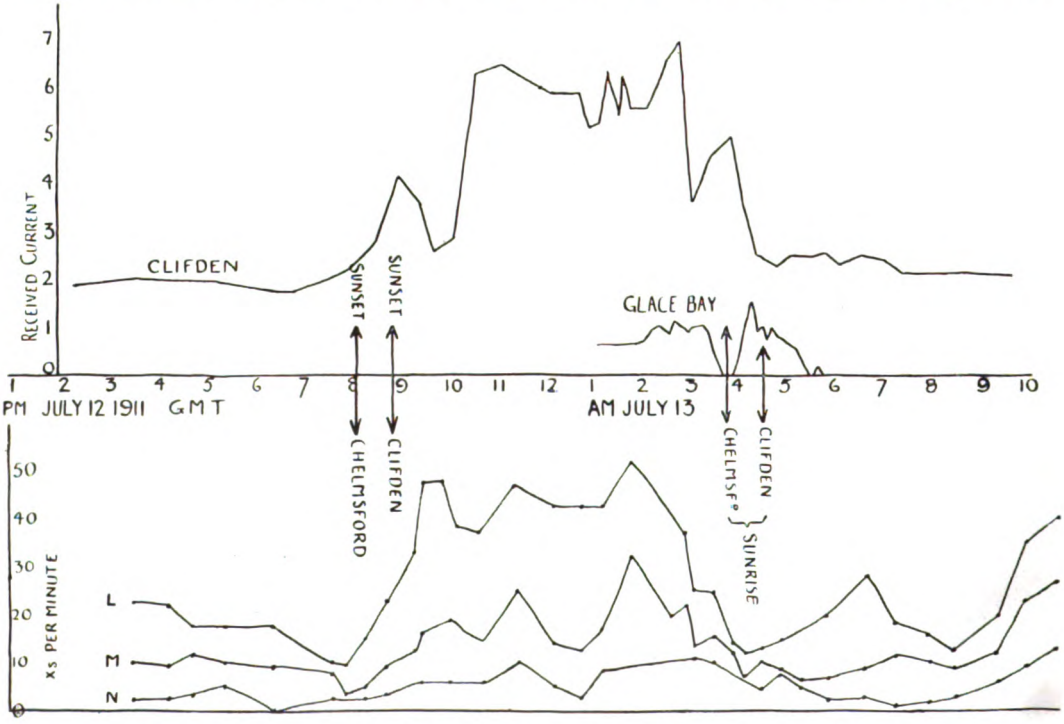


*Fig. 1. Upper curves relate to Clifden and Glace Bay signals received at Chelmsford; lower curves represent X's at Chelmsford on July 12 and 13, 1911.*

Figure 1 represents the results during a 21 hours' continuous test throughout which Clifden read their aerial ammeter every hour, and arranged to send once at least every half-hour. In the two curves shown (Figure 1) of Clifden and Glace Bay the strength at any point is proportional to the square of the ordinate.

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One very interesting feature is that at sunrise at Chelmsford, and for several minutes on either side of sunrise, Glace Bay signals vanished, although it was known that the latter station was sending at the time.

In Dr. Marconi's curves of strength obtained over the Atlantic a dip of signals invariably occurs between sunset at Clifden and sunset at Glace Bay. This is curiously absent in the curve of Clifden signals taken at Chelmsford. Mr. Tremellen made many attempts to obtain the minimum, but on looking through the records we can only find evidences of a slight kink in the curvature during the upward rise. This slight kink I have also recently noted in signals between Porto Velho and Manaos on the Amazon. The minimum only seems to become distinct over greater distances, or perhaps at other times of the year.

At Glace Bay there is often a slight rise of strength of signals from Clifden just about sunset at Clifden, this rise usually being observable simultaneously at Clifden with signals from Glace Bay. In Figure 1 this rise and the great rise of strength when the sun is setting at the most westerly station apparently overlap and suppress the minimum. The minimum of signals about one hour after sunset at Clifden is very noticeable at Chelmsford, and the position of the minimum is a distinct function of sunset. Thus on July 12th, 17th and 26th, 1911, the times for the minimum were 9.55, 9.48 and 9.37. The most remarkable rise of all is that between 10 and 11 p.m.; very often signals will quadruple in strength in five minutes. The rise of strength is apparently most noticeable over short distances, for it is rarely obtained over the Atlantic except as a freak. After the sunset maximum between Clifden and Glace Bay is over a period of extreme variability sets in, but between Chelmsford and Clifden an extremely irregular period occurs only after the above rise has taken place. About an hour before sunrise at Chelmsford a minimum occurs which is not quite so regular in occurrence as the 10 p.m. minimum, and maximum occurs at sunrise at Chelmsford which compares curiously with the sharp minimum from Glace Bay. After this signals fall first to an irregular period. Possibly there is a tendency to another minimum. Day strength then sets in with very few variations taking place.

Curves L M and N were taken simultaneously with the curves of Clifden and Glace Bay, and represent the number of strays per minute (counted) which reached a maximum voltage of 3, 6, and 12 volts respectively across the receiving transformer secondary. At first there seems to be a general resemblance between these curves and the signal curve. In so far as there is a general increase of X's, particularly small ones, at night this is true, but the day variations are very great. Usually in the summer there is a maximum about 4 or 5 p.m. One noticeable point about curve L is the maximum at the 10 o'clock minimum of Clifden's signals. We have other records to prove that this occurrence is not accidental. Its exact import is difficult to appreciate, but we proved beyond doubt that it was not the action of these X's on the receiver that caused the minimum of signals. It will be noted that this is a maximum of small X's, if curves L and M are subtracted. A comparison of the curves between Clifden and Glace Bay, and between Chelmsford and Glace Bay discloses the fact that during certain periods of the night rapidly varying signals are obtained. Over the shorter distance these rapid variations are seldom of

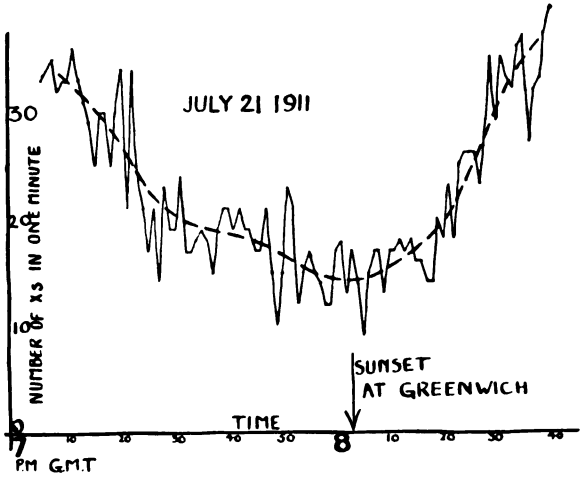


*Fig. 2. A Record of X's near sunset, taken at Chelmsford, July 21, 1911.*

sufficient amplitude to weaken signals to even the average day strength. But over the Atlantic the variations are of much greater amplitude and convey the idea that average signals are no stronger than daylight signals. In these curves the minimum occurs, roughly, twenty minutes after Chelmsford sunrise, but if curves L and M are subtracted it will be seen that there is a "small X" minimum very near to sunrise. It should be noted that there is a maximum of small X's after the sunrise minimum. These curves seemed to indicate a minimum of X's just before sunset. Mr. Tremellen went into this point fairly completely, and practically settled that at least in July at Chelmsford the minimum is within a minute of the moment when the top edge of the sun sinks over the horizon. Figure 2 represents a series of observations taken over about one hour and



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forty minutes on July 21st, 1911. On many nights this minimum was hidden by local storms. I have since on several occasions taken many of these minima and actually roughly determined the longitude on board a ship by means of them. These minima are usually only observable on long waves, and Figure 3 shows clearly the effect of wave-length on the minimum, two curves being drawn over the same sunset at 13,500 ft., and 19,700 ft. wave-lengths. It will be noted in examining the curve of Clifden (Figure 1) :

1. That there is a maximum at about sunset at Clifden—the most westerly station.

2. That there is a maximum at about sunrise at Chelmsford—the most easterly station.

These maxima are also noted on Dr. Marconi's curves taken across the Atlantic, where it is shown that short waves give the highest maxima. The sunset and sunrise maxima and minima are usually simultaneous at both stations. Reasoning from these observations of signals at sunset (the darkness being to the eastward at Chelmsford), one would expect a maximum of distant strays, especially of short wave strays. An examination of wind charts at South Kensington has led me to believe that at sunset and sunrise a steady state of the atmosphere occurs when there are less air eddies than usual. Consequently if one assumes that a large number of strays are produced locally by the collision of charged and uncharged masses of air, these local strays will be a minimum when the air eddies are a minimum. Therefore the only X's received at sunset will come from a distance, and short wave X's should predominate. This is distinctly shown in Figure 3. What probably happens at sunset is that a minimum of local X's overcomes a maximum of distant X's. One can apply exactly the same reasoning for

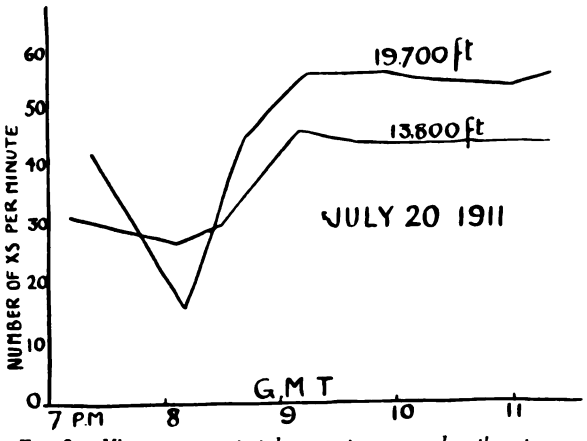


*Fig. 3. X's near sunset, taken on two wave lengths at Chelmsford, July 20, 1911.*

sunrise, the distant strays now coming from the west. Unfortunately we have no data on short and long waves at sunrise. A possible explanation of the maxima of small X's after sunset and sunrise is that local X's are stored up during the steady state, and rise to a maximum when air eddies occur again.

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# Phenomena of Terrestrial Magnetism

## And the Effect upon Wireless Telegraphy

### By Dr. C. Chree

THOUGH not an expert in wireless telegraphy, I have read with interest the communications on the effect of daylight upon radio-telegraphic waves in the August and September numbers of THE MARCONIGRAPH, by Prof. Fleming, Dr. Eccles and Mr. Wheeler. These writers refer to various possibilities in which a part is played by phenomena of terrestrial magnetism and atmospheric electricity, subjects to which I have devoted special attention. It may thus tend to narrow the inquiry if I refer to some geophysical phenomena with which experts on wireless may be less familiar. Mr. Wheeler, if I correctly interpret him, thinks that the difference between wireless phenomena by day and night may be directly due to the difference between the intensity of the earth's magnetic field in the day and night hours. Even in the horizontal component of magnetic force—which shows a notably larger diurnal variation than the vertical component—the regular daily range is only of the order of ½ per cent. of the force. A variation relatively so minute can hardly be the *direct* cause of so prominent a phenomenon as the one in question. Again, irregular changes in terrestrial magnetism are numerous, and at times much larger than the regular changes. Thus, if variations in the magnetic force of the size of the regular diurnal inequality can produce large effects on the transmissibility of electric waves, similar large effects should be

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of frequent occurrence both by night and day, and during really large magnetic storms the effect should be simply enormous.

**Evidence from Aurora**

Dr. Eccles' theory is that for the purposes of wireless telegraphy the earth may be regarded as surrounded by a " lower " atmosphere but slightly ionised, a " middle " atmosphere strongly ionised by day, and an " upper " atmosphere permanently ionised. He apparently supposes electric waves to be reflected under all conditions by his " upper " atmosphere, and the difference between day and night to be due to the fact that the " middle " atmosphere is highly ionised only during the day. Dr. Eccles seems somewhat vague as to the heights of his " middle " and " upper " atmospheres and as to the rapidity of transition of electrical conditions in passing from one layer to the next. These, however, are very vital points when it comes to considering the probability of the theory.

Probably the only direct evidence we possess as to the electrical condition of the atmosphere at heights higher than manned balloons have attained is afforded by Aurora. Assuming—what is hardly open to doubt—that aurora is an electrical discharge, the portion of atmosphere occupied by an aurora must possess high conductivity. Estimates of the heights of aurora were of uncertain value until recently, but Prof. Störmer of Christiania has obtained satisfactory photographs of auroras from the ends of a measured base, and has thus estimated the height of selected prominent points trigonometrically. He took a number of these observations in the spring of 1910 in the north of Norway. The calculated heights varied from 24 to well over 200 miles, heights from 60 to 80 miles being the most common. Different parts of aurora measured on the same occasion sometimes differed in height by more than 100 miles. Aurora presumably attains both lower and higher altitudes than Prof. Störmer's observations included. Aurora is very frequent in a so-called auroral belt passing from the north of Norway to near the south of Greenland, but is rare in Southern England and very rare indeed in Southern Europe. The absence of visible aurora may be due to deficiency either of electromotive force or of conductivity ; thus the high conductivity, of whose frequent existence at heights over 30 miles in Arctic latitudes aurora affords direct evidence, *may* not be limited to particular occasions or to particular latitudes, but be universally characteristic of altitudes of 30 miles or even less. There are, however, various reasons for believing that the conductivity is abnormally high in space occupied by aurora, and so the *continual* existence of a very high conductivity in the atmosphere all over the globe at heights of 30 miles and upwards, though probable enough, cannot be said to be demonstrated. Further the strong probability is that the conductivity at these heights is not constant, but in the auroral belt at least highly variable.

**Mathematical Support**

This latter conclusion is supported by the phenomena of terrestrial magnetism, if we accept the views of Prof. Schuster, who has made a special study of the subject. He claims to have proved mathematically that the main part, at least, of the regular diurnal magnetic variation is directly due to electrical currents in the upper atmosphere. This view is generally accepted, even by those magneticians who question whether the physical data at Prof. Schuster's disposal were altogether adequate and satisfactory. The amplitude of the regular diurnal magnetic variation varies greatly with the season of the year, and the changes as a rule are notably more rapid by day than by night. These phenomena might conceivably be associated with changes solely in the electro-motive force. But the facts that the diurnal variation at any season is much larger in years of many than of few sunspots, and that the difference between day and night phenomena is relatively reduced in years of many sunspots, amount almost to a proof of variability in the conductivity in the regions occupied by the currents to which the diurnal variation is due. This, at least, is the view that has been taken by Prof. Schuster and myself independently. It is possible, of course, that the currents in question are below the ordinary aurora level. There are, however, strong reasons for thinking otherwise. In the latitudes where aurora prevails the range of the regular diurnal magnetic variation is much enhanced, and irregular magnetic variations are large and numerous. Further, at times of bright aurora, in temperate latitudes, it is usual to experience the large irregular variations known as " magnetic storms." During these storms a regular diurnal variation can be traced which possesses a specially large range, and resembles that in high latitudes in showing a reduced difference between day and night.

**Interrelated Currents**

These phenomena are certainly most easily explained by supposing the currents producing aurora and those causing magnetic variations, both regular and irregular, to be very closely interrelated. The probable seat, in short, of both discharges is what is generally known as the upper atmosphere, and the natural inference is that any action which the conductivity of

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the upper atmosphere enables it to exert on wireless phenomena will be far from constant. One would, in fact, expect a difference between day and night, between summer and winter, between temperate and auroral latitudes, and between years of many and of few sunspots.

More definite information is desirable as to what Dr. Eccles means by his "middle" atmosphere. Judging by remarks on pp. 90 and 92 of his Royal Society paper, it comes down to within 12 miles—possibly a good deal less—of the earth's surface, but is above the ordinary cloud level. What the electrical conditions are at, say, the 12 mile level is very problematical. The conductivity depends both on the mobility and the number of the ions. The mobility, under laboratory conditions, increases rapidly as the air pressure diminishes; thus, if the number of ions is large the conductivity will naturally be high. But as regards a difference between day and night, what seems most natural in the "middle" atmosphere is something intermediate between what occurs in the upper and the lower atmospheres. In the former, as we have seen, there is strong reason to believe that in the absence of aurora conductivity is reduced at night, but by no means relatively negligible. In the latter, conductivity does not seem specially low at night; at some stations, in fact, the maximum seems to come before sunrise.

### The Earth's Vertical Electrical Field

A phenomenon which Dr. Eccles mentions as probably characteristic of the middle atmosphere is that "there occurs during the day a great sifting of oppositely charged ions under the operation of the earth's vertical electric field, positive ions moving up and negative ions moving down." This would be equivalent to an upwardly directed vertical current during the day, with presumably a corresponding downwardly directed current soon after sunset. If this be the case, it seems to add to the difficulty of explaining one of the great puzzles of atmospheric electricity—viz., that in fine weather the vertical current at ground level is practically always directed downwards by day as well as by night. As a matter of fact, the intensity of the earth's vertical field is known from balloon experiments to diminish very rapidly as we rise in the lower atmosphere. At the three-mile level it seems to be of the order of a tenth of what it is at ground level, and whether it has a finite value at the twelve-mile limit is, at least, somewhat doubtful.

The only other point I shall refer to in Dr. Eccles' paper is the remarkable disappearance of "strays" he describes as occurring about ten minutes before sunrise and ten minutes after sunset. If generally true, this would be a fact of much significance. Confirmation of its generality by means of records taken for some time at several stations, preferably with some form of self-recording apparatus, is thus highly desirable. Remarkable changes in the earth's electrical field at sunset and sunrise have been described by more than one observer, but in this case, judging by the continuous records obtained at observatories, the phenomenon would seem to have been either of a purely local character or else accidental.

Assuming—what seems hardly open to doubt—that sunshine exerts some potent influence on the medium in which wireless waves are propagated, that influence must vary with the altitude of the sun, and thus greater heterogeneousness should prevail along the path of the waves by day than by night. Increased homogeneousness naturally means diminished loss of energy by reflection.

I think special interest would attend experiments made within the Arctic circle during the continual day of midsummer and the continual night of midwinter, especially if regard were paid to the presence or absence of aurora.

## Spanish News

During the discussion in Parliament of the War Office estimates, the Marquis of Teverga, who holds the rank of major in the Military Engineers, urged that one and a half million pesetas should be allocated for the purpose of military wireless stations, land and portable type. The proposition did not succeed, however, although there is a likelihood that something may be done when the estimates are discussed before the Senate.

* * *

The wireless station at Soller, on Mallorca Island, was opened for public service on October 14th. This station was constructed by Marconi's Wireless Telegraph Company, and is operated by the Compañia Nacional de Telegrafia sin Hilos. The power employed in it is 5 kw., and the wave-lengths 780, 600, and 300 metres; the range over sea is 800 km.

* * *

The Marconi Training School at Madrid has been open since September 21st, and is performing a very useful work. So keen is the desire of young men in Spain to become wireless operators that on notifying the students that there were vacancies for twenty operators on board ship, about 200 applications were made, and after a severe examination no fewer than fifty candidates obtained sufficient marks to entitle them to a certificate.

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## Time Signals

The International Conference on Time Reckoning was opened at the Paris Observatory by M. Guist'hau, Minister of Education, on October 15th. The Minister proposed as president of the conference M. Bigourdan, Member of the Institute and of the Bureau des Longitudes. The conference has been summoned mainly with the object of dealing with various practical uses to which wireless telegraphy may be put, especially in the synchronisation of time signals throughout the world. Another question considered was that of the co-operation of various observatories in order to increase exactitude and the types of wireless instruments most serviceable for the purpose of transmitting the hour, as well as the exact degree of accuracy which the signals must attain for the requirements of astronomers, geographers, navigators, meteorologists, and the general public. One object of the Conference was to bring about a general organisation for the transmission of the hour by wireless telegraphy throughout the world, also to establish a definite scheme for the immediate transmission of weather reports, which have, in view of the progress of aeronautics, become of enormous practical importance.

* * *

A little account of the reception at Greenwich Observatory of the wireless time signals from the Continent is furnished in this month's *Observatory*. Till last month they were of no importance to the astronomers; but the Admiralty has now installed an aerial and receiving apparatus, and wireless time signals are now regularly recorded morning and evening—a new departure for Greenwich, which hitherto in these matters has found it more usual to give than to receive. At 10.44 a.m. a series of Morse V's is heard, which are the preliminary warning calls, and lasts with a series of "T's" for fifty-five seconds. Then, at a quarter to eleven, the first "time signal" comes. Silence for one minute; then more warning calls, and the Eiffel clock strikes 10.47 a.m. It finishes with 10.49 a.m.; and the mean of these time signals is the adopted "time." Roughly, the Eiffel Tower signal comes about one quarter of a second late with astonishing accuracy and consistency. These, however, are not the only signals. There is another series received from Norddeich, in Germany, and, like the Eiffel Tower signals, these also begin with tuning "V's." The Eiffel Tower tuning signals resemble the crumpling of tissue paper; those from Norddeich are more like the squealing of a rabbit. In all there are six groups of five signals each, received from Norddeich. So far the chief points are the extraordinary accuracy of the signals and the ease with which they can be observed. They are certainly worth the confidence of navigators. Paris may be considered as 200 miles, and Norddeich as 270 miles from Greenwich.

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## Educational and Lecture Notes

On October 17th Professor Marchant, of Liverpool University, delivered the first of a course of six illustrated lectures on "Wireless Telegraphy," which are being held at the university under the auspices of the Faculty of Engineering. In introducing his subject the lecturer dealt at some length with the history and progress of the invention. The lectures are being continued each Thursday in the Lecture Theatre of the Laboratory of Applied Electricity, Brownlow Street. They are illustrated by experiments and lantern slides, and are supplemented, when necessary, by demonstrations with the wireless station attached to the laboratory.

* * *

From the University of London, University College, we have received particulars of two courses of post-graduate lectures to be delivered by Professor J. A. Fleming. The first course, which commences on Wednesday, November 6th, will comprise six lectures upon electromagnetic waves and the theory of electrons, and is intended for electrical engineers chiefly concerned with telegraphy, telephony and wireless telegraphy. Those attending this course are assumed to have an elementary knowledge of the differential and integral calculus and of elementary electrical theory. It is preliminary to a course of radiotelegraphy which will commence in the following term, Wednesday, January 22nd, 1913. The latter lectures are intended to enable telegraphic, telephonic engineers and radiotelegraphists to follow the most recent investigations in the theory and practice of wireless telegraphy. The fee for each course is £1 11s. 6d., and tickets may be obtained from the secretary, University College, Gower Street, London, W.C.

* * *

A demonstration in wireless telegraphy, arranged by the University Extension Society, was recently given by Mr. G. P. Bailey, M.A., before a large and appreciative audience at Stowmarket. The lecturer spoke at some length on the relationship between Hertzian waves and wireless telegraphy, and afterwards illustrated his lecture with practical experiments.

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## An After-dinner Autograph

SIGNOR BORIANI is co-proprietor of the Pall Mall Restaurant at the Haymarket, London. He is besides a man of much enterprise and has not allowed opportunites to pass by unheeded. His profession brings him into contact with the *élite* of the world of wit and fashion, and some years ago he conceived the happy idea of paying the more notable members of his *clientèle* the compliment of a request for their autographs for preservation

*A. Boriani, by Caruso.*

(we hardly dare say writ neatly) in a large book. The names of authors, musicians, statesmen, *prime donne*, aviators, are to be found in these pages, and often a distinguished signature is accompanied by some *jeu d'esprit* or thumbnail sketch by no means unworthy of the owner of the great name written beneath. Signor Boriani can tell many amusing anecdotes of the way in which many of the notable signatures came to be included in the book, and some of his recollections of autograph collecting make a fascinating article in the October issue of the *Strand Magazine*. Commenting on Mr. Lloyd George's autograph, which is appended to some Welsh hieroglyphics, he expatiates on the difficulty experienced in obtaining the Chancellor's consent to writing in his album, affirming that it was only a long list of great statesmen's signatures that persuaded Mr. Lloyd George to include his own in the number. "But," adds Signor Boriani, "Mr. Marconi was even more difficult." In this instance he succeeded by a ruse. One day he saw Mr. Marconi entering the restaurant, and noticing the table at which the great inventor intended to sit, he took the menu card, and for *Haricots verts au beurre*, which was an item on the bill of fare, substituted *Haricots verts à la Marconi*, in compliment to his guest. But the celebrated inventor was not to be bribed, however neatly a compliment might be turned. "Why should the beans be labelled '*à la Marconi*,'" he remarked to his host, "seeing that they were—very ordinary beans?" Signor Boriani professed himself to be deeply hurt that his dish should be so lightly judged.

"Quite ordinary beans?" he objected. "but did Mr. Marconi find them stringy?"

"No, not the least suspicion of anything approaching a thread was to be found in them."

Then Signor Boriani brought the whole battery of a Southerner's exquisite logic into play. "Therefore, they were in very truth *Les Haricots verts sans fils*"—that is to say, those French beans were acknowledged to be threadless—"but since Mr. Marconi was the inventor of La Télégraphie sans Fils, surely the beans had every right to be called *Haricots verts à la Marconi*." There was no disputing such logic, and when the victor in the argument produced his little album what could Mr. Marconi do but sign the proffered page?—while we, by the courtesy of Signor Boriani and the publishers of the *Strand Magazine*, are able to reproduce this signature here.

## On the River

"Stroke, you're late," said Thomas, butting me violently in the back with his oar.

"My dear Thomas, when you have been in the Admiralty a little longer you will know that 'bow' is not the gentleman who sets the time. . . ."

"I'm not used to the Morse system of rowing, that's the trouble," explained Thomas. "Long-short, short-short-long, short-long. You're spelling out the most awful things, if you only knew."

*The Holiday Round.*

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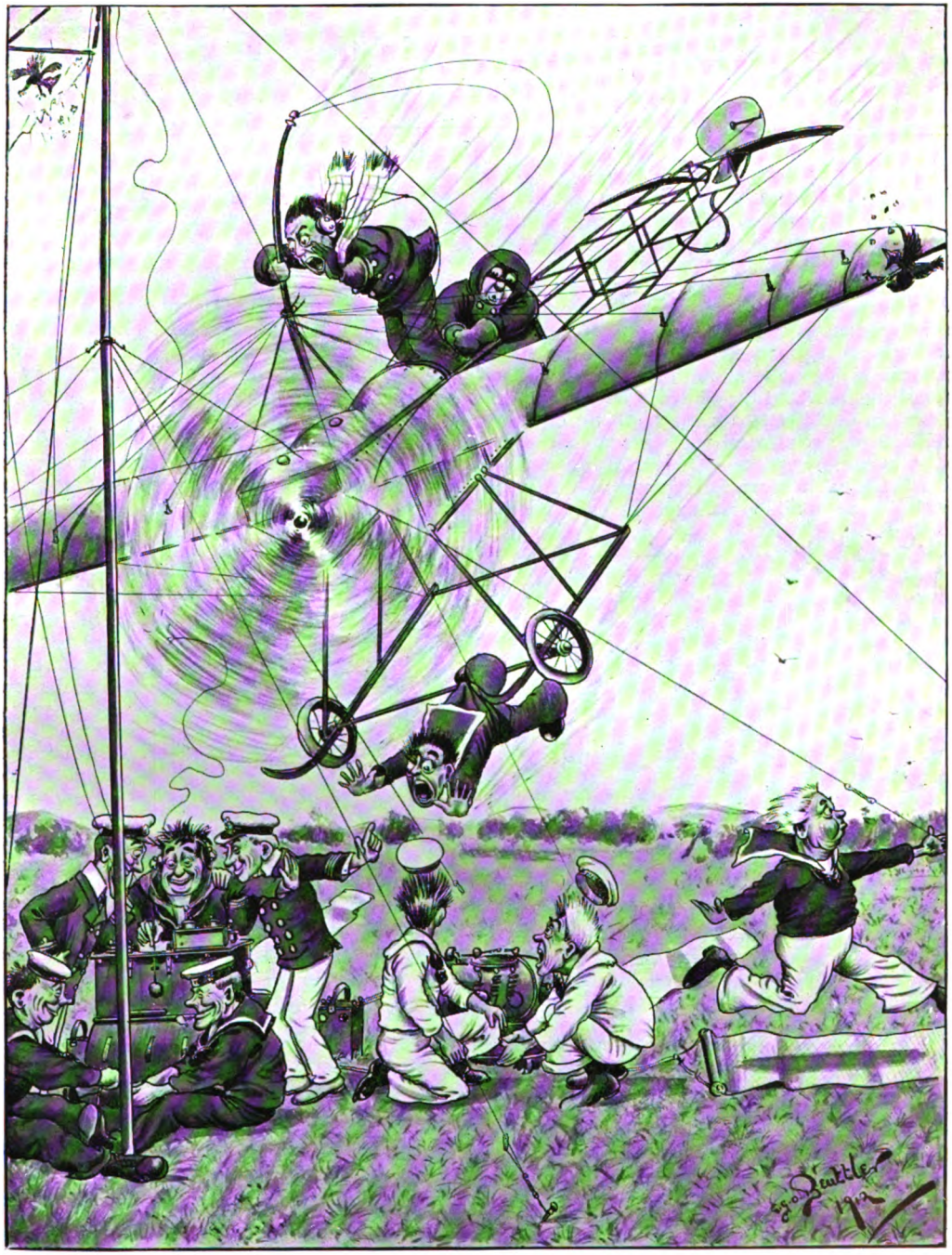

"WIRELESS" EXPERIMENTS WITH AEROPLANES

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# Wireless Telegraphy in the Tropics

## The Colombo Station

THE new wireless station at Colombo in Ceylon was opened in July last, and it is already proving its value as a coast station for communication with vessels engaged in the Eastern trade. The need for a station at Colombo was felt for a long time; the port has assumed first-class importance, mail steamers calling regularly as well as men-of-war and the mercantile marine of all nations, while it is now one of the finest artillery harbours in the world. Seen from a distance at sea this "outmost Indian isle," as Ceylon was known to the old geographers, wears a truly beautiful appearance. The remarkable elevation known as "Adam's Peak," the prominent though not the loftiest of the hilly ranges of the interior, towers like a mountain monarch amongst an assemblage of picturesque hills, and is a sure land-mark for the navigator when as yet the Colombo lighthouse and wireless station are hidden from sight amid the groves and palms that seem to be springing from the waters of the ocean.

*View of Colombo Harbour. Customs House in centre.*

Adam's Peak is chiefly remarkable as the resort of pilgrims from all parts of the East. The hollow in the lofty rock that crosses the summit is said by Brahmins to be the footstep of Siva, by the Buddhists of Buddha, by the Mahommedans of Adam, whilst the Portuguese Christians were divided between the conflicting claims of St. Thomas and the eunuch of Candace, Queen of Ethiopia. The footstep is covered by a handsome roof, and guarded by priests of a rich monastery half-way up the mountain, who maintain a shrine on the summit of the peak.

Arriving in Colombo Harbour, the new station immediately impresses itself upon one's mind. From the distance one catches a glimpse of two steel masts, wide apart, rising up from the ground to a height of 270 ft. and supporting the wires which stretch across the intervening space, with little wooden hoops here and there, around which the wires are spaced. This and a little brick-built house, some 50 yards from the masts, are practically all that is to be seen by the casual visitor.

The station has a 5-kw. installation capable of communicating with ships over a distance of 450 nautical miles. Two steel masts, 270 ft. high, composed of steel sections 10 ft. in length and 2 ft. in diameter, have been erected. They are 600 ft. apart and support an aerial system consisting of two cages, comprising six wires spaced around ash hoops 3 ft. in diameter. The total amount of wire aloft is approximately 10,000 ft. The building has been erected by the Public Works Department, and is divided into three rooms—one to accommodate the transmitting instruments, the second to accommodate the receiving instruments, and the third serves as a store room. The transmitting apparatus consists of a motor generator set, with a single-phase motor directly coupled to an alternator, an exciter, and a rotary spark discharger, all coupled to the same shaft. This generator, which has been designed to work off the city electric supply, is provided with a pulley in order that the set may be belt-driven from a 10-h.p. oil-engine, which has been installed. The transmitter will be capable of

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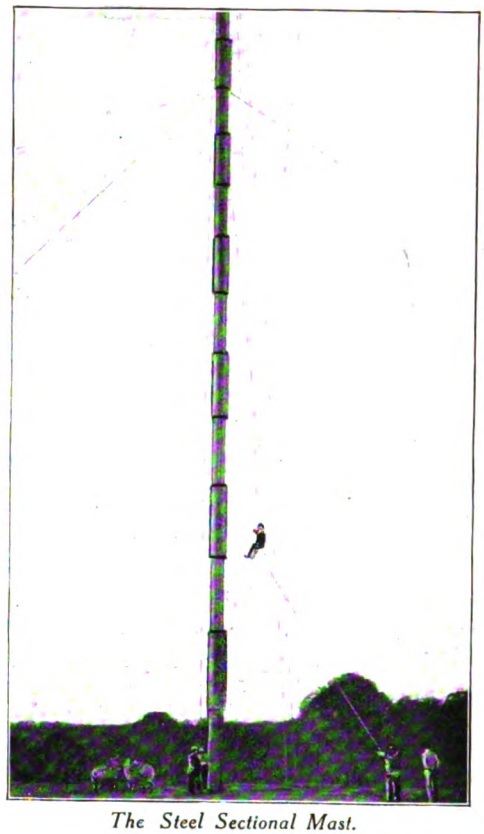
transmitting waves between 600 and 2,000 metres in length, being well beyond the limits that may be required. The rotary spark discharger, driven at 2,000 revolutions per minute, is provided in order that the signals received by neighbouring stations may be received as a musical tone.

The receiving apparatus consists of a Marconi standard magnetic detector, and multiple tuner, together with a Fleming oscillation valve detector.

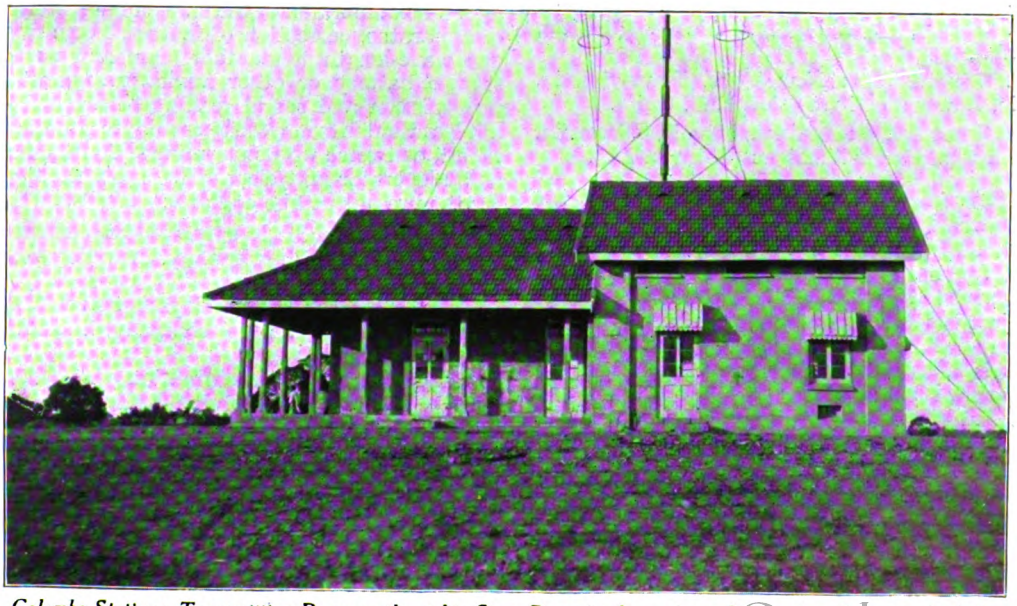
Although this installation is guaranteed for 450 nautical miles there is little doubt but that the range will be in excess of this figure, especially during night time, it being well known that the propagation of ether waves during night time is considerably facilitated.

As it is essential that good connection should be made with the earth, 15,000 ft. of wire, connecting galvanised iron plates buried in the earth and arranged in a circle around the transmitting room, have been laid. The selected site is very suitable for the efficient working of the station, and the close proximity of the paddy-fields should be very favourable for transmission purposes.

Mr. J. R. Stapleton is in charge of the station, and he is assisted by three native operators. It has already been explained that the station is intended to work with ships. The rate of transmission of telegrams has been fixed at 8d. per word, made up of 4d. per word for coast station and land line and 4d. per word ship tax.



*The Steel Sectional Mast.*



*Colombo Station : Transmitting Room on the right ; Store Room in the centre and Operating Room on the left.*

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# Official Regulations

## United States

AN Act prohibiting the use of United States ports by ocean-going vessels carrying fifty or more persons, unless such ships were fitted with efficient wireless apparatus and carried a qualified operator, came into force in the United States on July 1st, 1911. On July 23rd of this year an Amending Act was passed in accordance with which ships navigating the great lakes are now included, while more definite regulations are laid down regarding plant and operators. We published particulars of the Amending Act in the September MARCONIGRAPH. Since then the Department of Commerce and Labour at Washington have issued regulations concerning the operations of the Act of this year. The first section of the regulations deals with the administration of the Act, and announces that the department has established the following districts, which will be in charge of inspectors stationed at the ports named :

1. New England States (Boston, Mass.).
2. New York and part of New Jersey (New York, N.Y.).
3. Pennsylvania, part of New Jersey, Delaware, Maryland, Virginia (Baltimore, Md.).
4. North and South Carolina, Georgia, Florida (Atlantic coast), Porto Rico (Savanah, Ga.).
5. Gulf States and Florida (Gulf Coast) (New Orleans, La.).
6. California, Hawaii (San Francisco, Cal.).
7. Oregon, Washington, Alaska (Seattle, Wash.).
8. Great Lakes : New York, Pennsylvania, Ohio, Lower Michigan (Cleveland, Ohio).
9. Great Lakes : Indiana, Illinois, Wisconsin, Minnesota, Upper Michigan (Chicago, Ill.).

These inspectors, also customs officers, are empowered to visit steamers before they leave port, and ascertain if they are equipped with the apparatus in charge of the operators prescribed by the Act. Where a steamer subject to the Act is without the apparatus and the operators prescribed, or either of them, and is about to attempt to leave port, the inspector must :

(*a*) Notify the master of the fine to which he will be liable and of the particulars in respect of which the law has not been complied with ;

(*b*) Notify at once the collector of customs, if necessary by telephone ;

(*c*) Prepare in writing a report of his action, stating particulars as in (*a*), to be transmitted to the collector of customs. The collector will transmit a copy to the United States attorney for the district in which the port is situated.

The Act does not authorise the refusal of clearance in case of violation of its provisions, but specifically provides for the imposition of a fine of not more than five thousand dollars upon conviction by the court. The collector of customs, accordingly, when advised that a steamer subject to the Act is attempting to leave port in violation of its requirements, must at once notify the United States attorney. The Act does not apply to a vessel at the time of entering a port of the United States. Inspectors and customs officers may, however, accept as evidence of the efficiency of the apparatus and the skill of an operator messages shown to have been transmitted and received by him over a distance of at least one hundred miles by day during the voyage to the United States.

### Operators' Certificates

The second section deals with the question of operators, and the regulations are in accordance with the International Convention. In the case of vessels under the flag of any nations which have not ratified the Convention, the operator, before the departure of the vessel from the United States, must furnish the inspector with evidence that he is " skilled in the use of the apparatus." The Commissioner of Navigation will issue operators' certificates of skill, and operators holding these certificates will be recognised until December 13th, 1912, as persons " skilled in the use of such apparatus." To secure a certificate an operator must pass an examination in the care and adjustment of apparatus, correction of faults, change from one wave-length to another, care and use of storage battery or other auxiliary apparatus, transmission and sound reading at a speed of not less than fifteen words per minute American Morse, or twelve words per minute Continental, as the operator may elect. These examinations for the present will be open to :

1. Operators actually employed as such by a wireless or steamship company, including shore operators.
2. Operators seeking employment as such by a wireless or steamship company, including shore operators.
3. Applications for examination of operators of either class may be made by the wireless or the steamship company on behalf of a number of operators by name.
4. Applicants under eighteen years of age must satisfy examining officers of their intention to secure employment as commercial operators, if passed.
5. Women are eligible for examination under the conditions above.

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## Revised Wireless Rates

AN important alteration in the rates for the transmission of messages to and from ships through American coast stations takes effect on November 1st. This is one of the results of the working arrangements entered into earlier in the year between the Marconi Companies and the Western Union Telegraph Company of the State of New York. The method of counting and charging for American land lines differs from what is known as the "cable" or international system. In the American system the address and signature are free, and the words of the text only are counted, with a minimum charge for ten words. In the international system the address and signature are counted and charged for in addition to the text. Formerly the radio-telegrams sent from ships through American coast stations were subject to the system of charging used on the land lines. Now the existing message rates *viâ* certain American coast stations are cancelled, and in place thereof through word rates with a minimum charge for ten words become effective so far as these coast stations and Western Union North American land lines are concerned. The cable system of counting and charging will be used throughout, the address and signature being counted and charged for. Every message which contains less than ten words will be charged for in the same manner as if it contained ten words, subject to certain deductions in the case of vessels which do not apply a minimum. The wireless rate applied by the coast stations has been fixed at 12 cents per word, with the exception of Siasconset, where the rate has been fixed at 17 cents per word. To these rates must be added the land line word rates to and from all points in the United States of America. Thus the combined ship, coast station and land line charged rate for a message to or from New York City through Seagate is 22 cents per word. The cost of a message through this station containing ten words, address, text and signature would therefore be $2.20. If the message contained only eight words there would be an allowance of 8 cents ship tax for each word below the minimum.

The introduction of a flat rate per word in radio-telegraphy will do away with the complications that must necessarily exist as the result of the imposition of land taxes upon ship taxes, which are counted and charged for upon different systems. The new rates represent an important step towards the realisation of the flat word rate. It will now be a simple matter for the sender of a radio-telegram, or the operator, to ascertain the cost per word of messages passing through American coast stations. This new arrangement is the direct outcome of the important arrangement which has been made by the Marconi Companies with the Western Union Telegraph Company, and is calculated to greatly facilitate traffic.

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## Berne Notes

In accordance with the instructions of the Japanese Government, Chosen, Formosa and Japanese Sakhalin have been registered in the sixth class. The republic of Saint Martin has also been registered in this class.

* * *

The report on the new coast station at Antivari-Volouïtza should be modified to read that the station is intended for public service with all ships furnished with the Marconi system.

* * *

The Emperor of Austria has appointed Col. Rudolphe Schamschula to be Manager-General of the Telegraph in Bosnia-Herzgovina in succession to General Henri Goiginger, who has been promoted to another post. Col. Schamschula is anxious that the present friendly relations between the Administration of Herzgovina and the other offices shall continue.

* * *

Circular No. 43, issued on October 1st, refers to the appointment of the Hon. Robert Heaton Rhodes as Postmaster-General for New Zealand, in place of the Hon. Geo. Ell, who has retired. His Excellency, Sabri Bey has been appointed Minister of Posts, Telegraphs and Telephones of the Turkish Empire, in place of his Excellency Mehmed Talaat Bey.

* * *

The Italian Government having ratified the International Convention, the country's coast stations are now open for general public correspondence.

* * *

The Russian Administration have announced that the hours of service of the coast stations Fort d'Alexandrovsk and Petrowsk are from 5.50 to 9.50 a.m. and from 11.50 a.m. to 3.50 p.m. (St. Petersburg time).

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# The Marconi Agreement with the Government

## Debate in the House of Commons

ON October 11th the House of Commons approved the decision of the Government to appoint a Select Committee to investigate the circumstances attending the negotiations of the Agreement between Marconi's Wireless Telegraph Co., Ltd., and the Postmaster-General for the establishment of a chain of wireless stations throughout the Empire. In the course of the animated debate to which the proposal gave rise references were made to the sinister reports, amounting to allegations of corruption, which had been put forward in various quarters. A monstrous fabric of falsehood, misrepresentation and misunderstanding was razed to the ground as the result of the speeches by the Chancellor of the Exchequer and the Attorney-General; and, in the words of one of the Press correspondents in the gallery, "Never in the history of the House of Commons has there been a more shattering and more crushing reply to odious calumnies."

From a broad standpoint the debate was exceedingly interesting, inasmuch as it helped to clear up several misunderstandings about the terms of the contract. From the allegation that the bargain made with the company was tainted with corruption, almost all the speakers dissociated themselves entirely, believing it to be without a shadow of foundation, and one hon. member expressed the hope that the Committee would call before it any persons who made charges of the kind.

### Objections Outlined

The debate was opened by Sir Henry Norman, who submitted various reasons for his disapproval of the Agreement. The hon. member contended that the Agreement did not carry into effect the resolution of the Imperial Conference, as the stations to be erected under it could not possibly be described as "State owned." He contended that the Government were needlessly employing a middleman to buy ordinary and every-day machinery and materials which it ought to purchase by tender in the open market. No guarantee of electrical efficiency was even asked for, he maintained, whereas a slight output of electrical energy would render the whole scheme ruinously expensive. A further reason for disapproval of the Agreement by Sir Henry Norman was the alleged extravagant royalty which the Government were to pay, and the duration of this royalty. Sir Henry Norman contended that the Postmaster-General, notwithstanding what he had told the House, could only employ any other system at a huge waste of public money, and by deliberately contracting the public out of rights specifically conferred upon them by Act of Parliament. He maintained that the stipulations regarding inspection and disclosure were wholly intolerable unless Clause 18 were dropped, and that the Post Office in spite of previous warning and votes of censure had once more set its hands to what would be to all practical intents and purposes a monopoly for the Marconi Company. The final objection of the hon. member was that the ratification of this Agreement would inevitably result in the formation of a great monopolistic trust which would restrict the development of wireless telegraphy, double its cost, and set back independent scientific progress for a generation.

### A Question of Dividend

Mr. G. Terrell turned his attention to the shares of the Marconi Company, and pointed to the fact that the shares had risen from a low figure up to a high figure during the time that the contract was in negotiation and within a few months after it was published, and, he said, all this was presumably on the strength of the contract. The Postmaster-General later in the debate asked Mr. Terrell whether he was aware that the Marconi Company began to pay dividends for the first time last year. Mr. Samuel further pointed out that on July 11th the company paid an interim dividend at the rate of 5 per cent.; in December a further interim dividend at the rate of 5 per cent.; and in June, 1912, a final dividend at the rate of 10 per cent.; so that for the year 1911 the Marconi Company, which had never previously paid any dividend on its ordinary shares, paid for the year a dividend of 20 per cent. The Postmaster-General emphasised the fact that that had no relation to the contract, for the contract was not yet operative. He showed that the company had not received a single sixpence of revenue under it, and that the

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dividends had been declared out of the profits of the business. The following extract from the official report of the debate is interesting:

Mr. Herbert Samuel: "I would ask the hon. member for the Chippenham Division (Mr. G. Terrell), across the floor of this House, was he aware that a dividend of 20 per cent. was being paid by the company for the first time that year? If he was aware of it, why did he leave the House to believe that the rise in the price of shares was due to this contract, without mentioning that fact?"

Mr. G. Terrell: "I was not aware of the dividend the company was paying. What I referred to was the speech of the chairman, in which he stated that this Marconi contract was the most important business of the year."

Mr. Herbert Samuel: "I do not think that that absolves the hon. member at all. Of course, any chairman of a company which was entering into a contract with the Government would naturally speak of it in terms of the warmest praise when meeting his shareholders. This tender was accepted in March, 1912. In October, 1911, the Marconi Company bought up the rights of the Lodge-Muirhead patent, which, having just been extended by the courts, had a considerable term of years to run. That, from the patent point of view, which is of supreme importance in this business, placed the Marconi Company in a very strong position, a stronger position than they had before. Was the hon. member aware of that? If so, why did he not mention it as one of the reasons why these shares had risen? Further than that, in March, 1912, just at the time when the tender was being accepted, the Marconi Company brought patent actions against the United Wireless Company and the Clyde Shipping Company. These were test actions to decide the validity of certain remarkable patents, and the Marconi Company won them both. As a consequence of this, on March 25th they absorbed the important United Wireless Company of the United States. *The Times* in their financial article of March 27th last said that there was a strong buying of Marconi ordinary shares on the news of the absorption, and they pointed out the rise in price."

We need make no apology for inserting here this extract from the Postmaster-General's speech, inasmuch as it brings to light circumstances which have never been mentioned by those who have tried to draw evil deductions from the fact that when the contract had been entered into prices had risen.

All the points raised by the other speakers were fully covered by the Postmaster-General, and will be referred to when we summarise the latter's speech.

### Unsupported Charges

It was Mr. Lansbury who brought about the intervention of the Chancellor of the Exchequer. The member for Bow and Bromley referred to whispers which have been passing round the City. There had been grave rumours, he said, that considerable sums of money had been made by persons who had information which was not available to other people, and he expressed a hope that there would be no shrinking on the part of the Select Committee. Mr. Lloyd George instantly rose and said he hoped there would be no shrinking on the part of those who made the allegations. When Mr. Lansbury pointed out that he was not the only member who had spoken of the rumours and pleaded that he had not mentioned the Chancellor of the Exchequer's name, Mr. Lloyd George demanded to know what were the allegations made. "If," he said, "the hon. member has any charge to make against the Government as a whole, or any individual member of it, I think it should be done openly." He added that the Government wanted to bring out "these sinister rumours which have passed from one foul mouth to another," and he demanded that Mr. Lansbury's charges should be formulated. The member for Bow and Bromley did not accept this challenge.

### The Attorney-General's Repudiation

The Attorney-General formally and emphatically denied that there was the slightest foundation for the suggestion that any person had used influence with the Government in the interests of the Marconi Company. In categorical terms he declared that he had never discussed from beginning to end the making of the contract by the Postmaster-General. Indeed, he said, he did not know such a contract was in contemplation until a few days before it was signed.

As for the Attorney-General's alleged intervention against the continuance of a rival patent, the fact is that by law the Crown must be represented at every such application. The reason is simple. The High Court, in considering whether a patent should be extended, must receive some independent statement of the public as distinct from the private interests involved. In the present case, Sir Rufus Isaacs, on receiving the papers, handed the brief to Sir John Simon, the Solicitor-General, who dealt with it in Court, making it quite clear that he was there not to oppose but

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merely to set out the facts for the Court's opinion.

**The Postmaster-General's Reply**

Mr. Herbert Samuel made what has been admitted on all sides to be a strikingly able speech in defence of the Agreement. He confirmed Sir Rufus Isaacs' statement that there was not a syllable of truth in the insinuation that members of the Cabinet had, knowing that the contract was in contemplation, directly or indirectly, bought shares in the Marconi Company. "Neither I myself nor any of my colleagues," he affirmed, "has at any time held one shilling's worth of shares in the company directly or indirectly, or derived one pennyworth of profit from the fluctuations in their price." The suggestion that the contract was discussed privately or secretly between himself and the Marconi Company was utterly preposterous, as it must have appeared to be to any hon. member acquainted with the way in which Government affairs are managed. There is a Standing Committee representing six departments of the State called the Cables Landing Rights Committee, of which the Postmaster-General was a member, and of which the Parliamentary Secretary for the time being of the Board of Trade was chairman. That Committee was acquainted with the whole of the negotiations from the beginning to the end. As long ago as March, 1911, that Committee decided that a State-owned system was desirable and that the Marconi Company should be approached with a view of its carrying out the work. In May, 1911, the Committee agreed to a long report of several printed pages going into every aspect of the matter and suggesting terms on which the company might possibly be employed as contractors. From that date until the first tender was accepted the Committee held eleven meetings, was acquainted with the whole of the negotiations from beginning to end, and, on January 24th, 1912, approved the price to be paid, the royalty to be given to the company, and the period of years during which the Agreement should run. In the summer of last year (June, 1911) the Imperial Conference passed a resolution that it was desirable to establish a system of State-owned wireless stations, and the duty devolving upon him to carry that resolution into effect, he formed a Special Committee to deal with this particular question in addition to the Landing Rights Committee, because that Committee did not contain experts or representatives of the Dominions. The Post Office Committee, of which Mr. Samuel himself took the chair, consisted of about twenty gentlemen representing six or seven departments of the Government containing the wireless experts attached to all the various departments concerned—both those attached to the Admiralty, the War Office, and the Post Office—and also containing the High Commissioners of the Dominions. That Committee held three meetings, and on January 17th of this year the general terms substantially as they were now, but in outline, were before that Committee, and the Committee approved of those terms, subject to a proviso to which he would refer later. Afterwards the terms were laid before the Treasury, the Admiralty, the India Office, the South African Government, and the War Office, as well as the Post Office. All those departments formally expressed their approval of the terms; therefore was it not ludicrous, as well as wicked, to suggest that he was in a position to show undue personal favour to any company in this matter?

**Royalties**

Dealing with the question of royalty, Mr. Samuel stated that on August 7th he pointed out that if the Government were not using the Marconi patents—if the patents expired—from that date the Government ceased to pay any royalty, and that was provided for in the contract in accordance with clause 16, paragraph 2, which read as follows:—

> "If and whenever during the continuance of the royalty period the Postmaster-General would have decided to use and work on such stations as aforesaid a system of wireless telegraphy which shall not make use of any valid and still unexpired patents owned exclusively by the Marconi Company and shall give notice in writing to that effect to the Company, then, as from the date of the giving of such notice, the royalty period shall be terminated."

The meaning of the clause was that as long as the Government used the Marconi patents—valid patents—they paid this royalty up to a period of 28 years, but if the Government ceased to use valid patents they ceased to pay the royalty.

Sir Henry Norman had criticised the specifications, but he (Mr. Samuel) was in position to state that they had been considered in detail—and were now being considered in detail—by engineers of the Post Office and of the Admiralty. He had employed the best engineers in the public service, and he must necessarily leave technical details of specifications to them. He had asked those engineers what it would cost supposing the Government had determined to erect stations for themselves on the same specifications, and the figure which those engineers had given him was

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£60,800 each. That was the figure of the Post Office engineers and Admiralty engineers for erecting the stations in the same places, supposing it was done directly by the Government and they did not employ the Marconi Company.

Hon. members had asked " What are you buying for this royalty ? " Mr. Samuel replied :

" I have pointed out that we were buying the use of all their patents so long as they are valid, and when they are not we cease to pay the royalty. We are buying much more than that. We are buying—and this is in the contract—' the unpatented inventions—the secret inventions '—which I am told are really of considerable importance. We are buying what is more valuable still, the experience of long-range wireless telegraphy which they alone have, as they are the only company in the world which has kept a continuous commercial service over distances approaching those which would be necessary. Not only that, but we are buying their assistance—the technical assistance of their engineers during the whole period the royalty runs. Not only are we buying existent patents, but all future inventions which the company either owns or uses ; and further, when a period of 28 years comes to an end—the royalty having then at once come to an end—we are buying the right to use after that period any patent that may have been used, however new, in any of the stations without any extra payment. Lastly, we are buying the release for the Admiralty and the Post Office, without any extra payment, from the restricting covenants under which they are, under present agreement, not to reveal to any other Government departments any information they obtain in the working of the present patent."

Major Archer Shee had asked whether there was any proof of the speed at which the Marconi Company were able to work. The Marconi Company had given a demonstration of automatic working at a speed of 50 words per minute and over, which the officials considered to be satisfactory.

### No Alternative to the Contract

Turning to the attack which had been made upon him on the ground that he signed this contract on behalf of the Government, the Postmaster-General asked the House to consider what were the alternatives that were open, and he proceeded as follows :

" It has—in the first place—been suggested that we might have called for open tenders from every company or syndicate that thought itself able to carry out this exceedingly difficult work. That point was referred by me at the very outset to the committee of 20 members of which I have spoken. After discussion it was decided not to call for tenders, because all the expert members of that committee said that it was necessary to have proof that the people could do this work, and the Marconi Company were the only company in the world that was carrying on operations of this nature. . . . That, then, was the reason, and the reason why we did not call for tenders. We felt we could not speculate in this matter ; that we must be sure of our ground, and what the contractors undertook to do we must have reasonable ground of certainty they would be able to perform."

After explaining the reasons why neither the Post Office nor the Admiralty were able to undertake this work, Mr. Samuel drew attention to a quotation by Sir Henry Norman from a pamphlet issued by the Poulsen company and added : " I think it is necessary for me to show what my adviser at that time, November, 1911, reported to me. He reports—

" ' It is quite clear that the high-speed installation in its present form is not suitable for any sort of commercial work.'

My expert advisers tell me that we could not be sure, or have any certainty at all, that the Poulsen syndicate would be able to cover the distances which would be required by this contract by day." Mr. Samuel next referred to the statement that the Poulsen system had been able to maintain communication between San Francisco and Honolulu—a distance of 2,000 miles. " In wireless telegraphy," he added, " it is perfectly easy to send over long ranges by night. As long ago as 1903 Mr. Marconi was able to cross the Atlantic during the night with wireless telegraphy, and to send satisfactory messages. It was only seven years afterwards—in November, 1910—after the expenditure of great sums of money, that he succeded in maintaining continuous communication across the Atlantic by day.

### A Terminological Inexactitude

The hon. member," added Mr. Samuel, " would have been far more candid with the House if he had told them that the company had made no claim to communicate by day. As soon as I knew that the Poulsen people had established any sort of communication of that nature, I sent an adviser from the Post Office to San Francisco to test it, and there is no

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evidence that they can maintain that long distance by day——

SIR H. NORMAN: I think the right hon. gentleman will probably desire, when he reflects, to express regret to me for what he has just said, because in quoting that experiment I added "under extremely favourable atmospheric conditions."

MR. HERBERT SAMUEL: Why did not the hon. gentleman say by night? "By night" is two short words.

SIR H. NORMAN: Favourable atmospheric conditions mean by night.

MR. SAMUEL: Favourable conditions mean there are no atmospheric disturbances.

"A chain of wireless stations without assistance must work by day and night—must work over long ranges. And only recently the experts on wireless in the Post Office—whose advice I could not ignore—had reported to me that it was not safe to assume, without proof, that the Poulsen syndicate were able to apply fresh power to their system to work 2,000 miles by day. It is not a question of being able to do it by night, but it is a question of being able to do it by day."

### The Imperial Aspect

Towards the end of his speech Mr. Samuel informed the House that he was going to do something unusual. The most secret body in England—not excepting the Cabinet—is the Committee of Imperial Defence. He had the permission of the Prime Minister to divulge a secret, as such grave allegations had been made in this matter—that as long ago as May 31st, 1911, a sub-committee of the Committee of Imperial Defence considered this question of long range wireless stations, which, he added, was of far greater strategic than commercial importance, and had always been considered so by the Government. He (Mr. Samuel) was not a member of that committee, which resolved, on May 31st, 1911, that the six stations ought to be built, and that they ought to be built as soon as possible, that sites ought to be marked out, and the work ought to be put in hand upon them before the end of the year. On December 14th the matter was discussed before the Committee of Imperial Defence itself, and the members of that committee strongly advocated the urgency of carrying out that work. Eight months after the first resolutions of that sub-committee, in the following January, those first resolutions having been arrived at in May, and further urgency having been expressed in December, I had to decide whether the country ought to wait for a period—certainly of a year—before this contract should be made, and further, there was no certainty that at the end of that year the stations would communicate at all. It was merely a speculation and a mere gamble. "Suppose," he said, "by any evil chance a year or two had gone by and this country had unhappily been engaged in some European war. We have never had a great naval war in the days of electrical communication. The cables would very possibly have been cut, and large sections of our Empire might have been isolated from other sections. There would have been no means of giving orders from the garrisons, and no means of obtaining news. The nation would have said: 'Where are our wireless stations? Why is it that other Powers are erecting wireless stations, and the British Empire has no wireless stations? Have we no Committee of Imperial Defence? Let us have an inquiry into this.' The inquiry would have been held, and the committee would have reported that in May, 1911, a sub-committee of the Imperial Defence Committee had resolved that this was a matter of urgency, and should have been put in hand before the end of that year. Then the world would have asked, 'Whose duty was it to carry out this resolution?' 'It was the duty of the Postmaster-General.' 'Why did he not do it?' 'Because the experts were arguing as to whether this system was a little better than that system, and as to whether they could not save £10,000 here or £10,000 there.' 'What a Government!' it would have been said, 'and what a Ministry to have been unable to see the real importance of this thing, and to listen to members who say that six months or a year really do not matter!'

### Promise and Performance

"Under these circumstances," Mr. Samuel asked, "is there any man in this House who says I ought to have signed a contract with the Poulsen Syndicate last July, or with the Goldschmidt people, or anyone else, rather than signing that with the Marconi Company? All sorts of experiments are now being made and improvements already coming on. I have secured the right of the Government to use these improvements as fast as they can be effected. I was not going to wait until they had been effected before establishing these stations. Suppose I had at that time in March signed an agreement with the Poulsen Syndicate. What would have happened? That syndicate of Danish gentlemen is not carrying on any commercial work here. There is a completely separate body which works its patents in America. I do not say it would have been improper at all, but they would first have gone to the City to raise capital on the strength of the contract to carry out the work. Then the Marconi Company would have brought an

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action against them for infringement of patents, as the American company has brought an action against another company in America for infringing a patent, which action is pending in the Courts of California. Meantime, I should have been called upon as the Minister responsible to come to this House and ask it to approve of my contract. Hon. members would have said to me, 'Who is this syndicate of Danish gentlemen with whom you are entering into this contract and who are now in the City raising money in order to fulfil it? Have they proved that they can cover this distance at all?' I should have to say, 'Oh, no; but they assert they can, and very likely they may.' I should have been asked, 'Have they any staff of engineers able to put these stations in hand and complete them quickly?' I should have been compelled to reply, 'No, as far as I know they have no staff approaching anything like the scale necessary.' I should next have been asked, 'Are you sure their patents are valid?' I should have said, 'No, we believe them to be valid, but they have not been tested, and the Marconi Company are now disputing them in the Law Courts.' I should have been asked, 'Did your permanent officials advise you to make this contract?' I should have had to answer, 'No, my permanent officials unanimously urged me not to do so.' Under these circumstances, is there any man in the House, no matter how prejudiced he may be, who is now prepared to get up and say I was wrong in refusing to make that contract in January, and in taking the only other course possible?" Then, finally, the right hon. gentleman asked, "Is there any charge left against the Government? There is no response. Well, Mr. Speaker, I have done."

A great ovation marked the close of this speech. On the following day almost the entire Press of the country referred to the debate in the House of Commons, the comment referring almost exclusively to the personal aspects rather than to the merits of the scheme itself. The following are a few selections :—

*Daily Telegraph :*

"The discussion ought to put an end once and for all to the lying and malicious rumours which have been current for the last few months, and of late have been extremely prevalent. We welcome, therefore, the appointment of this Committee, and if individuals who have been most forward in disseminating the slanders in print can be summoned, so much the better. As for the contract itself, and the question whether the Government made a good or bad bargain, we shall await with patience the finding of the Select Committee."

*Daily News and Leader :*

"The public has a right to know on what precise material they (the critics) have based the charges with which a group of rather obscure weekly papers and a notorious monthly magazine have endeavoured to destroy the reputations for integrity of as many members of the Government as careless tongues, facile emphasis, and elastic innuendo could explicitly embrace. . . . Mr. Samuel's defence of the contract itself would probably content most impartial observers, as it certainly silenced the House last night. It is not a pleasant feature of the agitation that a great deal of it has been inspired less by a passion for pure administration than by zeal for some of the Marconi Company's rivals. But the broad fact, stated by the Postmaster-General last night, that while other companies said they could or hoped soon to be able to do more than the Marconi, none of them had in actual practice done as much, was not challenged from any side of the House."

*Morning Post :*

"In face of a clear and full statement of Sir Rufus Isaacs and Mr. Samuel, we may say with confidence that the honour of both these gentlemen, and the Government, remains unsmirched, and we may hope, therefore, to hear no more of this disagreeable side of the controversy."

*Daily Mail :*

"The mere fact that the contract was an excellent one for the Marconi Company is far from proving, as some people seem to argue, that it cannot also have been an excellent one for the Post Office and the nation. Business is not always a one-sided affair, and there are plenty of bargains which benefit both parties to them. . . . One has to remember that the Government as a demander and the company as a supplier were both in unusual positions—the Government urgently needed a service, which it was not as free to go without as a mere private firm without national responsibilities. On the other hand the Marconi Company had something like a monopoly of the power to render that service to its satisfaction—a monopoly, not of privilege, but of efficiency.

*The Star :*

"The Government acted very wisely in forcing the House to investigate the whole matter. They did exactly what their slanderers feared they would do. It would have suited the obscure gang who have poisoned the air to be allowed to go on poisoning it without being dragged out of

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their holes into the light of day. Now they are going to be dragged out. We need not say that the merits of the Marconi Agreement must be left to the Select Committee. . . . We are content to wait for the result of the investigation. But we are bound to say that if the Select Committee confirms the impression produced by the debate it will be a great personal, political, and business triumph for the Government and for the Ministers immediately concerned."

*Mr. T. P. O'Connor, M.P., in the "Star":*

"If he (Mr. Samuel) had not been a strong and gifted man, if his cause besides had not been of unanswerable force, both politically, financially and personally, he might have been affrighted, for the campaign had gone on for weeks, and calumnies are as the lives of a hundred thousand locusts, and the world is ready to believe evil, and there were plenty of rival companies, and statements had been made which *prima facie* sounded convincing. . . . He (the Postmaster-General) took the whole case, point after point, after brief and scornful repudiation of the personal charges, and with the deadly effectiveness of a machine gun he strewed the floor of the House with the remains of the disproved charges. He showed that there was no monopoly, that the expiry of the patents left the Government under the contract perfectly free to end the contract at a moment's notice, that if he had chosen the Marconi system it was because no other system had yet proved itself, that the price given was the best he could have made, that he was perfectly free to take back the big stations which the company were to erect. Finally, he touched a deep note when, amid the rapid and awed stillness of the House—which becomes very silent always in its moments of deep emotion—he read out the urgent message of the Imperial Defence Committee asking that in the interest of the defence of the Empire—with the possibility at any moment of a terrible war in which every movement of every battleship and every hour a garrison in the remotest part of the Empire had to be immediately brought into contact by a wireless system, he demanded whether he could wait and wait until some other system than the Marconi could at some indefinite time offer the same proofs of efficiency and success."

*Manchester Guardian:*

"Mr. Samuel's speech . . . presents the case for the Post Office in a distinctly reassuring aspect. He showed that in choosing it [THE MARCONI SYSTEM] instead of any of its rivals he was guided by the best expert opinion in the Government service."

*Leicester Daily Post and Mercury:*

"Debates in the House of Commons are often misleading. The voice of the critic is apt to be louder than the voice of the friend, and a discussion may convey the erroneous idea that the only supporters of a proposal are to be found on the Treasury benches. This afternoon the Agreement did not seem to have a friend; when Mr. Herbert Samuel had finished, however, the Agreement was rehabilitated, and the critics were in a sad case. . . . If, as has been suggested, the Agreement intentionally favours the Marconi Company, one may think it strange—indeed, almost miraculous — that such wilful favouritism could have escaped the notice of all those interested authorities. . . . On the technical, scientific and business aspects of the matter there is really as little need for inquiry by Select Committee or otherwise as there is on the question of the personal integrity of Ministers."

*Nottingham Express:*

"Upon these pacific criticisms which have been urged against the arrangement between the Government and the Marconi Company it would be well to suspend judgment until the Committee's report has been made; but Mr. Samuel's account of the manner in which the Agreement was made seems to afford little ground for the suggestion that it was brought forward rashly or inconsiderately or without due regard to the interests of the State."

*Aberdeen Free Press:*

"Mr. Samuel's speech settled the opinion of the House of Commons on the Marconi Agreement. Some members have been in doubt as to its merits, but at the close of his defence the House was ready to accept it and to approve of it, and it was realised that the Agreement could go before a Select Committee with the certainty of standing any examination."

*Glasgow Daily Herald:*

"The Marconi Company is said by the advisers of the Government to have far more experience in the working of long distance wireless telegraphy than any other company. It has undoubtedly led the way in the commercial development of the invention, and it therefore has a claim on our consideration. Its successes in obtaining the contract for the proposed Imperial stations cannot be said, therefore, to have come as a surprise."

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# The Parliamentary Committee

THE members of the Select Committee of the House of Commons appointed by the Government to inquire into the transactions which preceded the completion of the agreement between the Marconi Wireless Telegraph Co., Ltd., and the Postmaster-General number fifteen ; of these six represent the Liberal interests, six the Conservative, two the Irish Nationalists, and one Labour.

SIR ALBERT SPICER, BART., who is Chairman of the Committee, is head of Messrs. James Spicer & Sons, the well-known firm of stationers. He was educated at Mill Hill School, and afterwards was privately coached at Heidelburg. He has visited India, Australasia, and Samoa Islands on behalf of the important missionary societies. In 1892 he was elected Liberal Member of Parliament for Monmouth, and has represented Central Hackney since 1906. He is a Past President of the London Chamber of Commerce and a member of the Commercial Intelligence Advisory Committee of the Board of Trade.

MR. JAMES FALCONER has been Liberal Member for Forfarshire since 1909. He is an engineer, and was educated at Edinburgh University.

MR. GORDON HARVEY is one of Manchester's prominent cotton merchants, but has always taken the keenest interest in politics. Since 1906 he has represented Rochdale in the Liberal interest.

The HON. NEIL PRIMROSE is the youngest son of Lord Rosebery, and since 1910 has represented the Wisbech Division of Cambridgeshire as Liberal Member.

SIR HERBERT ROBERTS was created first Baronet in 1908. He has been Liberal Member for West Devonshire since 1892.

MR. HANDEL BOOTH, Member for Pontefract, completes the list of Liberal Members of the Committee.

MR. LEOPOLD AMERY is the Conservative Member for South Birmingham. After a brilliant college career he was elected Fellow of All Souls' College, Oxford, and was for some time engaged in journalism. He was editor of the "*Times* History of the War in South Africa."

LORD ROBERT CECIL, K.C., third son of the late Marquis of Salisbury, is a distinguished member of the Bar. He was for some time private secretary to his father. He is Conservative Member for Hitchin, Herts.

MR. GEORGE FABER, C.B., D.L., has represented Clapham as Conservative Member since 1910. He is a partner in the banking firm of Beckett & Co., Leeds, and a Justice of the Peace for Oxfordshire.

MR. DONALD MACMASTER, K.C., is Conservative Member for the Chertsey Division of Surrey. His early life was spent in Canada, and he was called to the Bar in Quebec in 1871, afterwards serving as Crown Prosecutor in several Canadian *causes célèbres*.

MR. HAROLD SMITH is Member for Warrington, and is a barrister by profession.

MR. HENRY TERRELL, also a King's Counsel, and Member for Gloucester since 1910, makes the sixth Conservative to be appointed to serve on the Inquiry.

The Irish Nationalists have two representatives : MR. JOHN MOONEY, Member for Newry, and MR. WILLIAM REDMOND, Member for East Clare since 1892.

Labour has one representative, MR. J. PARKER, who has been Member for Halifax since 1906, and is a Past President of the Trades Council and a member of the Chamber of Commerce.

# Intercepted Messages

## A Challenge Accepted

MR. J. A. BALCH, manager of the Mutual Telephone Company of America, in the following letter to the Honolulu *Star Bulletin*, accepts the challenge of the Federal Telegraph Company of America to give a Thousand Dollars if it can be demonstrated that any of the wireless messages sent over the Poulsen system can be intercepted by any but users of Poulsen instruments. In the letter below one of the messages which Mr. Balch claims the Kahuku station intercepted is omitted because of its length, The Mutual Telephone manager writes :—

In *The Commercial Pacific Advertiser* under date of September 4th, 1912, I noticed a statement, presumably coming from the officials of the Federal Telegraph Company, to the effect that the Poulsen system of wireless communication was a secret one, and offering a reward of $1,000 to any operator of a rival system of wireless communication who could intercept or capture such a message.

On behalf of the three operators employed at the Kahuku wireless station, this island (which station is a 10 kilowatt spark equipment, and belongs to the Mutual Telephone Co., Ltd., of which I am the superintendent), I hereby claim such reward ; and, furthermore,

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if the following intercepted messages are not sufficient proof, stand ready at any time to demonstrate how easy it is to intercept the messages sent out by the Federal Telegraph Company's station at Heeia, this island. Furthermore, such interception has been and will be effected by an ordinary spark system receiving equipment consisting of a Marconi loose-coupler opposed valve tuning coil and a Galena detector.

Here are a few of the intercepted messages as received at the Kahuku station :—

1. On July 24th, 1912, at 11.55 p.m., copied the following five :—Give us another period on Helix and half. We want to try another primary. 12.55 : We are using 29 in Helix and 2 composition. Do you want more composition ? Give us another period on one Helix and half. How do you get me now ? We are using 29 turns and 2 composition. Go ahead and give us another period on Helix and half.

2. Thursday, July 25th, 1912, 12.10 p.m. " PHU " (Poulsen) coming stronger, sent following message. Cunningham, PHC. Mr. Lewers is on the Coast, went up with Shriners and has not returned. Signed C. F. E. Go ahead, send a little faster. 12.55 repeated message to Cunningham, have long message here. Have you any ? Say, what number turns you using on Helix ? Go ahead.

4. September 5th, message to Jonas, San Francisco. Kindly let Advertiser have surely nightly scores baseball. Send all Pacific Army and Navy news. Movements Pacific Squadron. Hot Roosevelt, Taft, Wilson news liberal Japanese, Chinese (one or two words lost here. Last word is events).

5. September 5th. Here's important test message on which depends a great deal. Repeat it back to me. Sig. S.M. N.R. 4 HU S. M. 27 D.H. from HU September 5th to Matson, 268 Market Street, San Francisco, Federal Ischidrose Bengeltjes they Fruttase for Broeklint our berglehne cookmat heliorne harkvers this findest by Federal Ischidrose Complimentary also Cazzatello in full. Signed Castlecook.

6. HU S.M. D.H. to C N San Francisco, Ashburn W.U.T. After word promotion will reply local Mutual Company charge dollar and half for ten words cable count with fifteen cents additional to any of Islands. Nothing under dollar and half. Signed McCloskey.

7. Paid HU September 5th, 1912. To Hackfrisco, San Francisco. Mykoaksidu Hiogixivme Wekumaetfe Atugnuybu. No signature.

8. HU S.M. 18 D.D. September 5th, to C.N. San Francisco. Our four Hackfrisco San Francisco registers interchangeable as H. Hackfeld & Co., Ltd., 310 Sansome Street. Signed McCloskey.

Also the following message will prove that the spark stations on the coast have no difficulty in reading the Poulsen station at that point. This message copied by the PH (San Francisco station).

San Francisco, Aug. 28, 1912. S. B. Maddams, Honolulu.

One hundred dollars (XX) probably leave here first of month. Commercial man leaves to-morrow. Static is surely bad here but have improved receiving so that you are readable between 11 and 12 (not stating a.m. or p.m.) with increased power you should get when sending with loop grounded when receiving. Tell Mac that have not raised him 5907 73's to all.

C. F. E.

Sent from San Francisco station to Honolulu at 12.40 a.m. portion of another message states " John G. McCloskey leaves on Wilhelmina to-day to be manager."

Four years ago (October, 1908), on the completion of the Kahuku station, night communication was established between Hawaii and the mainland, and while this service has been an intermittent one, depending to a great extent on atmospheric conditions, still a reliable night communication has been something quite easy to establish at any time during the past four years. This, however, has been held in abeyance for the reason that I have not been able to see how such a service could be made to pay in competition with the reliable day or night cable service Honolulu is enjoying.

During 1911, tests were made from the Poulsen system in San Francisco to our Kahuku station, and while good results were secured on night communication, absolutely no signals could be received during the day hours.

During February, March and April of this year I had the opportunity of visiting several of the Poulsen stations—viz., San Francisco, Los Angeles, El Paso, Texas, and Chicago, Ill. Also going through many of the Marconi wireless stations along the eastern coast, my investigations of the merits of these rival systems left me thoroughly convinced of the superiority in every respect of the Marconi system ; also, I may further state, that suits for infringement of Marconi patent, number 763,772, and the Sir Oliver Lodge patent, owned by the Marconi Company, have recently been started by the Marconi Wireless Telegraph Company of America in the United States district court for the Northern District of California.

Yours truly,

JOHN A. BALCH.

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# Testing Plant for Wireless Apparatus

WE have already described the structural features of the new Marconi works at Chelmsford, and have noted the various operations carried on there. The hygienic and cheerful atmosphere which pervades all the shops, and the modern features of the equipment, have been specially remarked. But there is one corner of these works over which we have not yet conducted our readers—the testing room. The arrangements here are absolutely sound-proof and free from vibration. They are supported on separate foundations of concrete, upon which are built external walls of brickwork covered by a flat ferro-concrete roof. On the outside of the roof of each cabin are four aerial switches worked by solenoids controlled from the inside of the cabins. A Duddell oscillograph, for pressures up to 25,000 volts, is another interesting feature of the instrument room. This instrument shows voltage and current wave forms, with or without sparking, for transmission, the distorting effect of the sparking being clearly visible. The wave-forms can be photographed in short lengths or on continuous strips by cinematograph camera. At one table there is a potentiometer fitted with a switch for changing at one operation from the D'Arsonval galvanometer to a vibration galvanometer, and also from the accumulator

*The Instrument Test Room at the Marconi Works, Chelmsford.*

of special interest owing to the completeness of the equipment and the special nature of the apparatus employed.

The instrument test room is reached either from the corridor near the main entrance to the works, the mounting shop, or the finished stores. On entering this room we notice at one end two silence cabins which are for working on the external aerials. An examination of these cabins shows them to be

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*Another view of the Instrument Test Room.*

battery to the source of alternator-current supply. This instrument permits alternating-current measurements of currents, voltages, frequency, capacity, self-induction, and phase differences to be effected. At the next table is a Kelvin balance, Kelvin electrostatic voltmeter, and a Drysdale differential watt-meter for accurate measurements from 50 kw. to 0.01 watts. Another instrument which we might single out for mention is the Duddell vibration galvanometer, which is used with a Campbell inductometer to read inductances of 1 to 1,000 microhenrys within 0.1 per cent., the source of current being either a high-frequency "hummer" with periodicities of 1,000 to 2,000, or an alternator with a range up to 2,000 periods. There are air condensers for capacity testing, and a Cathode Ray oscillograph for obtaining photographic records of wave-forms with frequencies of the order of one million. For accurately testing the capacities of very small condensers in the region of 1/10,000th microfarad there is a Fleming-Clinton commutator which charges and discharges the condenser under test about 400 times per second.

Passing from the instrument test-room through the finished stores we reach the power test-room, where we find the large generating plant and switchboards in striking contrast to the delicate precision instruments which we have just left.

The generating plant in the power testing-room is capable of supplying the various forms of current required. The special machines are mounted on an overhead platform carried by steel joists on cast-iron columns. All of them are liberally built as regards copper, so as to run for long periods with only a small temperature rise, and the commutator and brush gear are specially constructed to avoid sparking at the very high speeds required.

A 2-kw. converter gives 100 volts at 50 periods. A 3-kw. motor generator gives 100 to 400 periods at 300 volts with a pure sine curve, while a ½-kw. motor is coupled to a high-periodicity generator giving from 500 to 2,000 periods with a maximum speed of

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9,000 r.p.m. Another machine gives alternating at 10,000 volts, with a pure sine curve having 200 periods, and there is also a machine which consists of two direct-current generators in series to give 3,000 volts.

In addition to the main testing switchboard there is a switchboard for the a.c. supply-motor generators, and a number of distribution boards.

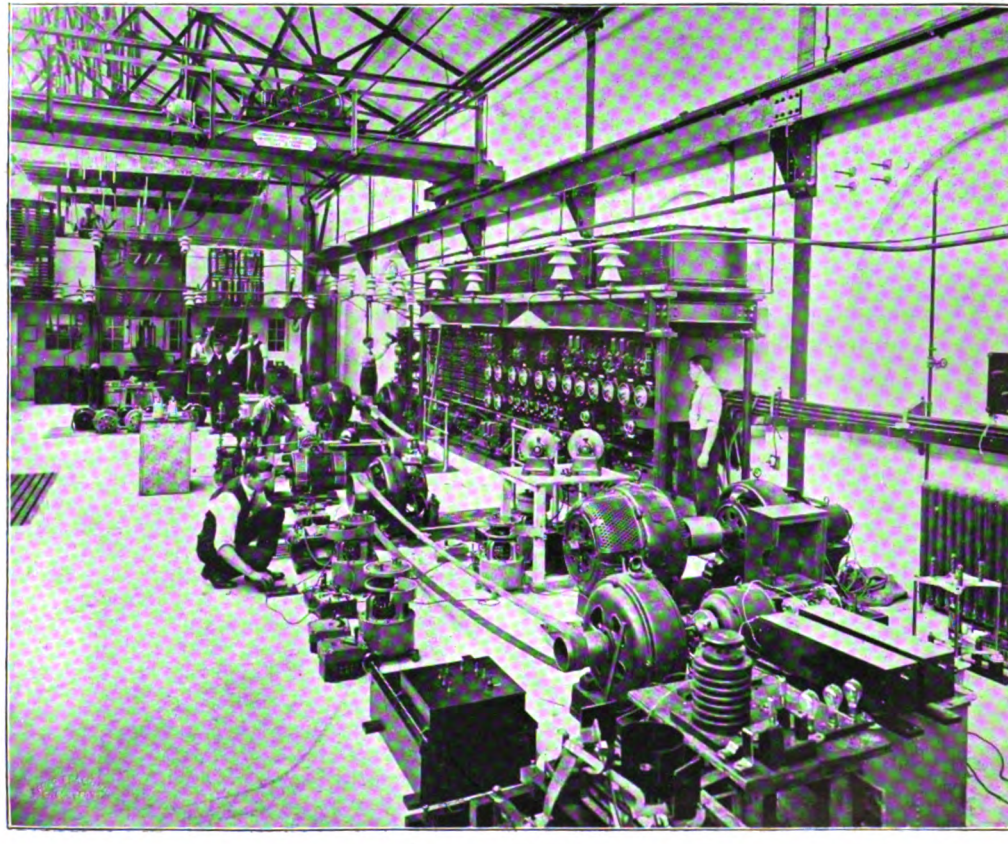
Mounted on the roof of the power test-room is a series of tin plates hung upon long porcelain insulators. These plates are in four parts, and form an artificial aerial of variable capacity, resistance and inductance. Another artificial aerial for measuring energy losses consists of four large stoneware oil baths containing galvanised steel plates.

A resistance calorimeter, used to represent the energy lost by radiation in aerials, consists of a continuous resistance wire bent backwards and forwards in a flat plane and woven together with asbestos cord, the sheet thus formed being bent round into the form of an incomplete cylinder, with the edges of the sheet 3 inches apart. The cylinder is contained in a copper vessel which drops into another copper vessel having a polished exterior the bright metal, with an air space between, the two being designed to avoid radiation losses. Tappings are taken off the resistance and brought through the top in thick glass tubes, and the oil is circulated by stirrers driven by a small motor. The apparatus will dissipate 20 kw., and will stand a pressure of 100,000 volts.

Adjoining the power test-room is the oil test-room, where the transmitting condensers used in installations of 300 watts up to 2 kw. are tested.

Adjoining the oil test-room is a small dark room for testing the capacities of condensers of the Leyden jar type. The major portion of the apparatus here is of a special nature, and is being designed by the staff of the Marconi Company for particular uses.

Before leaving the works a visit must be paid to the show rooms, where several complete wireless sets of different types and power are erected, and where demonstrations are given on the apparatus under working conditions.



*The Power Test Room.*

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THE MARCONIGRAPH

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The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

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### The Share Market

London: October 24th.

Since our last issue the markets have been in a feverish condition, due to the general outbreak of hostilities in the Balkans, and to this was added last week an advance in the Bank rate from 4 to 5 per cent.

The shares of the various Marconi issues have not been much influenced by general conditions—in fact, as we go to press, (October 24) the prices are higher than last account: Ordinary, $5\frac{1}{16}$; Preference, $4\frac{7}{16}$; Canada, 20s. 9d.; Spanish, $1\frac{3}{16}$; America, $1\frac{7}{16}$.

### The Phillips Memorial

The memorial at Godalming to John George Phillips, the wireless operator of the "Titanic," is to take the form of a cloister, with a small garden in the midst of it, and with seats sheltered from the wind and rain. The *Times*, commenting upon this proposal, warmly approves the decision of the committee, and adds that this is a memorial that will certainly be useful, and that may easily be made beautiful in a simple and quiet way, especially as the further wall is to consist of an arcading through which there will be a view of a broad water-meadow with wooded hills beyond it. The committee seem to have been aware of the obvious fact that a memorial is no memorial if everyone hastens to forget it as soon as it is set up. The cloister will be used, not ignored, and as long as it is used it will be associated with the name and story of Phillips.

The successful completion of the scheme, however, depends upon whether the necessary money can be obtained, the subscriptions to date amounting to little over £400. More money is required, however, and we hope that those who have held back from making any offer, waiting to see what kind of monument would be adopted, will now rally to the support of the scheme. The monument is in no sense merely a local one, for though the people of Godalming and the near neighbourhood feel that to perpetuate the memory of a splendid act of duty is a debt of honour that they are glad to acknowledge, yet it may well be regarded as a national concern. The amount received through THE MARCONIGRAPH has reached a total to date of about £100, and any further sums received will be forwarded to the Mayor of Godalming.

The telegraphists of the Argentine nation have forwarded through the Post Office, an address expressing admiration for Mr. Phillips, of which the following is a translation:—

To the Telegraphists of the United Kingdom.

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Fellow Telegraphists.—The Telegraphists of the Argentine nation who sign this in the name of all their companions throughout the Republic, do so in order to join in the manifestations of sympathy and admiration, as well as the tributes which have been paid to the memory of the unfortunate telegraphist of the "Titanic," Jack Phillips, who gave an example to the world of devotion to duty, despising danger and remaining firm at his post until he rendered up his life, an English hero.

We desire that this humble token of homage may also be taken as an expression of the fraternal feeling which prevails between the telegraphists of both nations, and of the esteem in which the colleagues of the heroic Phillips are held, not only in Argentina, but throughout the world.

Assuring you of our most respectful consideration,

We are, etc.

### Presentation to Mr. Bride

An interesting little ceremony took place at Marconi House, London, on Wednesday, October 23rd, when Mr. Harold S. Bride was presented by the Marconi International Marine Communication Co., Ltd., with a gold watch "in recognition of having done his duty, and done it bravely" on board the R.M.S. "Titanic." In handing the gift to Mr. Bride, Mr. Godfrey C. Isaacs, the managing director of the company, referred with extreme regret—a regret shared by all who attended the gathering—to the unfortunate circumstances which prevented Mr. Marconi being present. He assured Mr. Bride that the Marconi Company highly appreciated the way in which he had performed his duty. It was unnecessary to say anything about what that duty was: the whole world knew it. In the name of the company, and in the absence of Mr. Marconi, Mr. Isaacs handed to Mr. Bride a little souvenir in the shape of a gold watch in which was inscribed just the mere plain statement of fact. Mr. Isaacs hoped it would prove some satisfaction to the recipient, when he was older in years, to look back to his earlier days and remember that he did his duty. Mr. Bride made a brief response.

The Liverpool Shipwreck and Humane Society have sent to the Marconi Company a silver medal and illuminated address for Mr. Cottam, and these will be handed to Mr. Cottam on his arrival in England. The address reads:—

At a meeting of the committee of the Liverpool Shipwreck and Humane Society, held at the Underwriters' Room, Exchange Buildings, Liverpool, on the 4th day of July, 1912, it was resolved unanimously: "That the best thanks of the committee be presented to Mr. Thomas Cottam, wireless operator of the s.s. 'Carpathia,' for praiseworthy and humane service to the survivors of the R.M.S. 'Titanic,' which foundered April 15th, 1912."

### Wireless Telegraphy in the Royal Marines

It is announced that an increase has been granted in the allowance to officers of the Royal Marines when employed as instructors of wireless telegraphy from 2s. 6d. to 3s. 6d. a day, such allowance to be payable only to officers serving in the Royal Marines prior to January 1, 1912.

### South African Stations

There is a statement in the report of Mr. J. Wilson, the Postmaster-General of the Union of South Africa, of a series of curious happenings in the science of wireless telegraphy. The Slangkop wireless station, between Cape Town and Cape Point, under favourable conditions gets into communication with the incoming mail steamer on Friday night, three days before the vessel reaches Table Bay, and is generally on the same night still in communication with the outgoing mail steamer. The normal range of the Durban station is about 250 miles by day and 1,000 miles by night, while the higher-power installation at Slangkop has a range of approximately 400 miles by day and 1,600 miles by night. These are the ranges guaranteed by the Marconi Company, but it is of interest to note that on several occasions these ranges have, at night time, been greatly exceeded at both stations; in fact, in one instance the Durban station received signals from a vessel in the Suez Canal, and the Slangkop station states that signals which it picked up one night were those of the Poldhu station in Cornwall which was working across the Atlantic to Glace Bay, Newfoundland. These are, of course, only "freak" results, and no use can be made of these extraordinary effects for commercial purposes. The number of wireless messages dealt with at Slangkop during the last seven months of 1911 was 2,907, of a revenue value of £792. The station at Durban, though not so favourably situated as the one at Slangkop in respect of traffic with passenger steamers, transacts a fair amount of business and continues to give good results. The number of messages for the period mentioned was 543, of a revenue value of £164.

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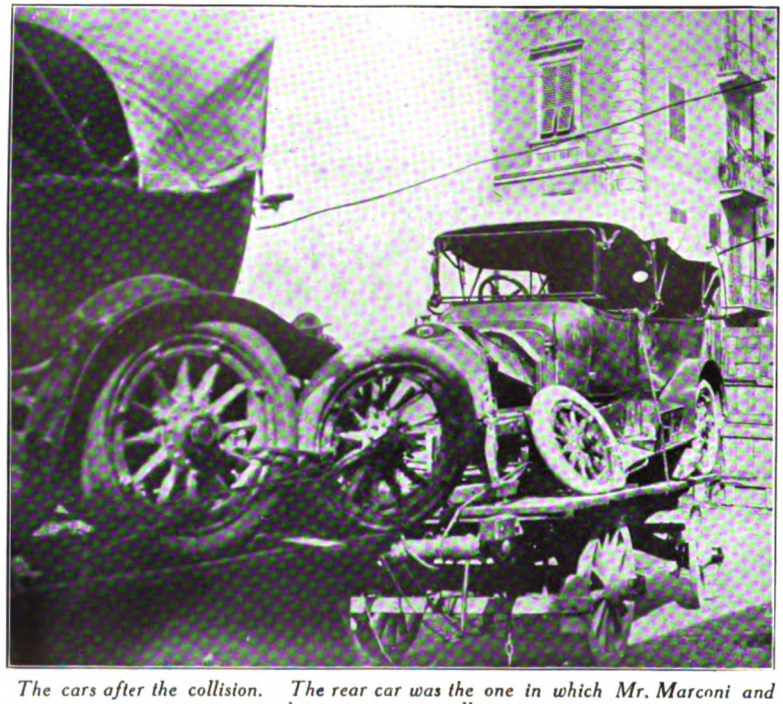
# The Accident to Mr. Marconi

THE report of Mr. Marconi's unfortunate motor-car accident at Spezia on September 25th has been received with world-wide sympathy. At the time of the accident Mr. Marconi, Mrs. Marconi, his secretary and chauffeur were travelling near Borghetto di Vara and were approaching a right-hand curve when another car, travelling at a rapid speed, suddenly appeared round the bend, and before Mr. Marconi, who was driving, had time to avoid it, the two cars collided "head on." All the occupants of the car received a severe shaking, but Mrs. Marconi, the secretary and the chauffeur happily escaped with nothing more serious than a few slight bruises. Mr. Marconi was, however, not so fortunate, for it was soon found that his right eye had sustained considerable injury. At the time it was impossible to gauge its exact nature, but that it would lead to no serious results was confidently hoped.

A telegram was immediately despatched to the Admiral in command at Spezia, who promptly sent his private car with a doctor and first-aid remedies, which arrived upon the scene within one hour of the accident, and conveyed Mr. and Mrs. Marconi to the Naval Hospital at Spezia. The road between Spezia and Borghetto is one of the most dangerous in Europe, the average gradient being one in fifteen; it crosses a range of mountains, and contains innumerable hairpin bends, yet, notwithstanding this, the car which the Admiral kindly despatched in response to the appeal for aid covered the 23 kilometers in twenty-three minutes.



*The cars after the collision. The rear car was the one in which Mr. Marconi and his party were travelling.*

At the Naval Hospital Mr. Marconi received the greatest kindness possible, and the authori-

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ties took infinite pains to provide all the skill and resource at their disposal. An eminent specialist from Bologna was summoned immediately, and Professor Bajardi, of Turin, was consulted as soon as an examination of the eye was possible.

Owing to the extent of the inflammation the doctors were unable for some days to formulate any definite opinion as to the exact condition of the eye, but after the inflammation had partially subsided, hopes were entertained that the sight would be preserved, the eye being sensitive to light. As time went by, however, the chances of saving the eye became more and more remote, and subsequently, as the result of a consultation with Professor Fuchs of Vienna, Professor Bajardi and all the Naval Doctors came to the unanimous opinion that the sight of the eye was irrevocably lost, and that there was a likelihood of sympathetic ophthalmia affecting the left eye if the right was allowed to remain. An operation was therefore performed for removing the eye, and was entirely successful; the following bulletin, signed by Dr. Montano, the Director of the Naval Hospital, being issued on October 17th:

> "Professor Fuchs, of the University of Vienna, and Professor Bajardi, of the University of Turin, met in consultation this morning and decided that it was necessary to remove the injured eye in order to avoid sympathetic ophthalmia. They therefore performed the operation, which was successful. General physical and moral condition of the patient was good."

Within two days there was a wonderful improvement in the condition of Mr. Marconi, who, on October 14th, was able to leave his bed for two hours. He has since continued to make rapid recovery, and it is hoped that he will be able to leave the hospital at Spezia before these lines appear in print.

It is satisfactory to know that an accident which might have had much worse consequences is likely to leave no further ill effects than the loss already referred to. Inquiries as to the condition of Mr. Marconi have been received from all parts of the world, and it is gratifying to be able to state that he is making such excellent progress. Their Majesties the King and Queen of Italy, who were staying at San Rossore, near Piza, made a special journey to Spezia on October 11th, accompanied by the Duke of Abruzzi, to pay a visit to the illustrious scientist. Throughout this trying period Mr. Marconi's optimism has never failed him, and he is looking forward to resuming his scientific investigations in the near future.

## Communication Between War Vessels and Merchant Ships

THE Board of Trade has issued the following statement to masters and owners of British merchant vessels:

The Board of Trade has been requested by the Lords Commissioners of the Admiralty to direct the attention of masters and owners of British merchant vessels to the necessity for arranging for periodical practices in wireless telegraphy communications between H.M. ships of war and ships of the British mercantile marine for the purpose of ensuring efficient and reliable communication when required.

It is therefore hoped that all British shipowners and masters whose ships are fitted with wireless telegraphy will co-operate to give effect to the following proposals: It is pointed out that the exercises must always be subject to the exigencies of H.M. service, and these practices should only be carried out when they will not interfere with commercial or naval work.

1. At 8.30 a.m. and 2.30 p.m. daily any single man-of-war (destroyers and small craft excluded), or one man-of-war in a fleet in company, detailed by the senior naval officer present, will adjust her wireless telegraphy transmitting and receiving apparatus to the commercial 600 metre wave-length and make the call "CCCC," followed by her own commercial call sign, indicating that she is prepared to carry out an exercise with any British merchant ship within range.

On a British merchant ship receiving this call she will answer and say whether or not she is prepared to proceed with the exercise. Should more than one merchant ship answer, the man-of-war will indicate which is to exercise and which is to wait.

The exercise will then proceed, but no messages are to be exchanged which are not authorised by the respective captains and masters of the ships practising. No message received during such exercises is to be forwarded beyond the ship actually receiving the message and no payment for any message can be made. The exercises are to be considered as strictly on service, and not for any commercial advantage

2. In all such exercises the man-of-war is to be considered the controlling ship.

3. The exercises will cease at 9.15 a.m. and 3.15 p.m. respectively, or before, at the discretion of the captains concerned.

4. These exercises are only to be carried out between vessels, neither of which is within 150 miles range of any commercial shore station using the 600 metre wave-length, and are to cease at once should one of H.M. ships so direct.

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# Unsolved Problems of Wireless Telegraphy

## Discussed by Dr. Eccles, Prof. Howe, Lord Rayleigh, Prof. Kennelly, Prof. A. G. Webster, Mr. S. G. Brown, and Prof. Baily

THE discussion upon the scientific theory and outstanding problems of wireless telegraphy, introduced before the British Association by Professor J. A. Fleming (whose paper was published in the October MARCONIGRAPH), gave rise to an interesting discussion. The main points in Professor Fleming's paper were the " bending " of the waves to follow the contour of the earth, and the so-called " daylight effect " which makes it possible in certain circumstances to transmit signals for a very much greater distance by night than by day, using the same power. Dr. Fleming was followed by Captain H. R. Sankey, whose remarks were also published in last month's MARCONIGRAPH.

The next speaker was Dr. W. H. Eccles, who summarised a long communication describing some of the outstanding phenomena met with in the transmission of electric waves, artificial and natural, over great distances, and examining how far they might be explained on the hypothesis of refraction or reflection of electric waves by masses of ionised air. The favourable influence of the ionisation of our atmosphere by the sun on the propagation of electric waves round the globe was first drawn attention to in a paper read in June last before the Royal Society by Dr. Eccles, in which he showed that the presence in the atmosphere of charged ions of molecular magnitude produced such alterations of the velocity of electric waves through the medium as would have appreciable effect on waves that travelled over long distances. Ions of various sizes were, no doubt, produced by solar radiation.

### Solar Radiation

The concentration of the ions due to solar radiation must increase as distance from the earth increased, and it was not unreasonable to assume that practically all the ions in the middle parts of the atmosphere were due to solar radiation. A consequence of this was that the velocity of electric waves would increase as height above the earth increased. It followed that a nearly vertical wave front would tilt forward as it travelled horizontally through the middle portion of the atmosphere, or, in other words, a ray travelling nearly horizontally in the middle atmosphere would follow a trajectory curved in the same sense as the earth's surface. In the lower atmosphere, where the ionisation and its rate of variation with height were small, the ray might not be bent appreciably. Thus, an electric ray starting from a point of the earth's surface in a direction inclined slightly upward, would pursue a straight path in the lower atmosphere and a slightly bent path with its concavity downward in the middle atmosphere. If its curvature here was on the average greater than that of the globe, the ray would be turned down to the lower atmosphere, and again traverse a straight line ; but in the other event it went farther and farther from the earth's surface and was lost to us.

It was obvious that, at or above any particular place on the earth's surface, the ionisation in the middle and lower atmosphere increased up till noon and diminished after noon. At sunset most of the ions formed by the sun would disappear rapidly by recombination, and this would leave the atmosphere unionised except in so far as local electromotive force might have sifted positive from negative ions during the day. At sunrise there would be great formation of ions. Thus, at the boundary of light and darkness in the atmosphere, there was a more or less abrupt change in the electrical conditions of the medium through which waves had to pass. This region of twilight might be expected to have a much greater influence on the propagation of waves coming from a great distance than on that of waves coming from distances which were not large compared with the height of the well-ionised layers.

### Upper Layers of the Atmosphere

Scarcely any of the phenomena to be described could be explained without assuming that there existed in our atmosphere some permanently ionised upper layers capable of reflecting electric waves. This hypothesis was put forward by Heaviside in 1900, but had as yet not been supported by any direct evidence. Besides the implicit evidence in favour of the hypothesis scattered through this communication, Dr. Eccles adduced some considerations

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from quite another quarter. In 1901 Newcomb made photometric measurements in America of the total light received at the earth's surface from a clear sky on a moonless night, and compared it with the sum total of the measured light from the stars. He discovered that the light actually received greatly exceeded that from the stars. This result had been confirmed by other observers, notably in 1907-8 in Holland, by Yntema, who found the extra light to be perceptibly greater near the horizon than at the zenith. Yntema suggested in 1909 that the extra light might be due to a sort of permanent aurora in the upper atmosphere. It was well known that W. W. Campbell showed in 1895 that the green auroral line $\lambda$ 5,770 could be seen on clear moonless nights in any part of the sky. This extra light had lately been measured on Mount Whitney by Abbott (August, 1910), with results similar to the preceding. Discussing this " earth light," as it was called, Dr. W. J. Humphreys, in the *Astrophysical Journal* of May, 1912, put forward and supported plausibly the new suggestion that the outermost layers of our atmosphere were kept permanently ionised by bombardment with dust of cosmical origin. An ionised upper layer such as this was exactly what was demanded by many of the facts of wireless telegraphy; but it was very doubtful whether Humphreys' views would be admitted by students of terrestrial magnetism.

In a very important discussion of the degree of conductivity required in the upper atmosphere to justify his theory of the diurnal variations of terrestrial magnetism, Professor Schuster arrived at a conductivity of the order $10^{-13}$ electromagnetic units at heights about 100 km. On this basis in the daytime the downward refraction of electric rays at the respective heights named would be so sharp as to be tantamount to reflection. Much lower conductivity than that demanded by Professor Schuster might suffice to produce beneficial bending of long waves round the earth by ionic refraction in the day.

### Day and Night Signalling

Turning to the phenomena that had up to the present been revealed by long-distance transmission, the prime fact was the discovery by Marconi in 1902 of the difference between day and night signalling. He found that signals which were readable at night up to 2,000 miles across the Atlantic were not readable in daylight beyond 800 miles. The author explained this by supposing that at night the permanently ionised upper atmosphere acted as a reflecting surface somewhat in the manner of a whispering gallery, while in the day it was put out of action by the ionised middle atmosphere.

It was now common engineering knowledge that the evil effect of hilly country on day signals was very much less, being sometimes almost negligible on waves of, say, frequency 100,000, than those of frequency 1,000,000. How were these truths to be accounted for? It was only necessary to assume that in the night the Heaviside layer reflected waves of all frequencies equally well; that the sky was, in an electrical sense, lighted up by the radiation from the sending station and sent rays into the valleys beyond the mountains, the effectiveness of the transmission being greater when the stations were not too close under the hills. In the day the ionised middle atmosphere veiled the reflecting layer, and, to some extent, refracted the waves over the mountains. This refraction was 100 times more potent with a frequency of 100,000 than with a frequency of 1,000,000.

### Transition from Day to Night

The transition from day to night conditions marked out a period of the greatest interest. The facts given by Marconi were as follows: Waves of length about 4,000 m. (75,000 frequency), crossing the Atlantic from west to east, yielded strong and steady signals all day at Clifden, which gradually weakened after sunset at Clifden, till a minimum strength was reached about 1½ hours after sunset. The signals at Clifden then gradually increased in intensity till after sunset at Cape Breton, when they attained a maximum which was occasionally very high. During the night they were very variable in strength, flickering from very weak to very strong. Slightly before sunrise at Clifden the signals grew stronger and sometimes passed quickly to a high maximum. They dwindled to a marked minimum about two hours later, and then returned to the normal day strength. The facts brought out by measurements on the Clifden signals received at the author's laboratory in London were as follows: During the day, signals were weak and not very steady; during twilight, they sank to a minimum intensity at about 20 minutes after sunset at London—that is, when the sun was setting at a place half-way between London and Clifden. After other and erratic fluctuations in strength, they kept increasing in intensity till well after sunset at Clifden. Sometimes, at about 10 minutes after that sunset, there came a short interval filled with huge flutterings of signal strength, the sounds in the telephones alternating from faint to loud with great rapidity, just as if the medium conveying the signals were stirred with a vast commotion; and then the signals quickly

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settled to their normal night strength, which, it must be noted, was always greater than their normal day strength. Similar phenomena, less pronounced, might be witnessed at sunrise.

### The Belt of Electrical Disturbance

It would be well to offer an explanation of these phenomena. In the first place, it was clear that when at sunset the rotation of the earth carried a region of the middle or upper atmosphere out of the sunlight, recombination of ions must take place on a vast scale. Similarly, at sunrise, formation of ions would take place. The regions in which these changes were occurring formed a great circular belt round the globe which was inclined to the meridian at an angle depending on the season. This belt of electrical disturbance was, of course, perpetually revolving round the globe. The ionisation occurring in the sunrise half of the belt, and the recombination occurring in the sunset half, might both be expected to take place with some degree of irregularity even in a still atmosphere, with the result that patches or banks of ionised air, analogous to the banks of fog met at sea, would transiently overhang the parts of the earth's surface that were in dusk. It was probable that these irregularities were greater in the sunset half of the belt than in the other, for it was not unlikely that considerable separation of ions of opposite sign might take place in the course of the day under local electromotive forces. In any event, the effect of such patches of heterogeneously ionised air on waves propagated through the region was, in view of the connection between the velocity of the waves and the concentration of the ions, to produce scattering by repeated refractions. Hence it was to be expected that the regularity of transmission through the steady ionised horizontal strata of the illuminated air would be greatly disturbed by the arrival of the twilight transitional patches, with the ultimate consequence that the signal sounds heard in the receiving telephones would be weakened. The author's own observations on the influence of ordinary cloud on signals proved that the ionically turbulent belt was above the ordinary cloud level, and thus it might be regarded as a sort of curtain enringing the earth and occupying the middle atmosphere without reaching the lower. It affected, therefore, the trajectories of waves received from great distances, and not those from small.

The natural electric waves that diverge from lightning strokes or other atmospheric discharges often travel long distances over the globe, and therefore exhibit the effect of the twilight belt. These natural electric wave trains make themselves evident in wireless telegraph apparatus by knocking or clicking sounds in the operators' telephones. These strays, as they are called for short, are in our latitude usually more frequent at night than in the day, both at land stations and at ship stations, and near sunrise and sunset the day conditions merge, of course, into the night conditions.

### The Solar Eclipse

During the progress of the solar eclipse of April 17th last a record was made of the strays received at the author's laboratory in London. The apparatus was set so as to receive signals of wave-length 5,500 metres, which is approximately the wave-length of the radiation from Clifden. The strays were fairly numerous, and the results of the observations showed that the time integral per minute of the number and intensity of the strays was 10 units at 11.46 a.m., rose rapidly to a first maximum of 22 units at 11.55, fell to a minimum of 8 units at 12.4, rose again to a maximum of 28 units at 12.13, and fell rather slowly to 10 units, the normal day level, by 12.40. The message-bearing waves from Clifden were brief and irregular, so no measurements of their intensity were obtained ; but it was very noticeable that they were loud when the strays were loud and *vice versa*, in rough proportion to the strays. These results were confirmed, so far as signals were concerned, by H. Schledermann, of the Danish Navy. The strength of the signals from Blaavands Huk Lighthouse in the North Sea was measured at Copenhagen Dockyard, 300 km. distant, and a " very remarkable strengthening of signals " was observed. The strongest signals were received a few minutes after the maximum of the eclipse. Schledermann does not mention the existence of any minimum.

The following rarely-observed phenomenon was noticed by Dr. Eccles during experiments on board a vessel off the coast of North America in August, 1909. Experiments were being made with apparatus designed for the determination of the direction from which signals were coming, and on various occasions on a particular day (but not on other days) the determination of the azimuth of a sending station 40 miles away differed in their extremes by nearly a point of the compass. It now seems not improbable that this might be caused by the presence of refracting banks of ionised air resting on the surface of the sea.

### Arctic Observations

Mr. C. H. Taylor worked with some stations of the American Marconi Company near the Arctic circle some years ago throughout three winter months. He found that the aurora exercised a most profound effect on signals.

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and always a favourable one. Sometimes when signals were too bad to read, the arrival of an aurora instantly brought good communication ; in fact, if during reception the signals became feeble, the telegraphist would walk to the office door, glance into the night, and find, as expected, that the aurora had disappeared. The effects were greatest when the aurora extended all round the zenith. Since then it has been remarked that even as far south as Montreal freak ranges are most common on nights of brilliant auroral displays. If it be permissible to identify the upper conducting layer of Heaviside with the strata in which the aurora forms, this connection between auroræ and signals proves positively that the upper layers do come strongly into play even in the distance of about 100 miles worked over by Mr. Taylor. The sharpness of the coincidence of periods of good and bad signals respectively with aurora and no aurora cuts out the possibility that the aurora may in some way influence the transparency of the lower layers, and so affect signals indirectly, and this conclusion is borne out perfectly by such results as those of Simpson, which prove that no connection whatever can yet be found between auroræ and the electrical condition of the lower atmosphere. The question of the height of the aurora is of interest in this connection. Some observers have given the figure as 10 km. or even less ; but the most recent and most trustworthy result is that of Störmer, who determined the height photographically as varying from 40 km. to 370 km. Accepting this, it seems to be proved that electric waves travelling 100 miles at night may be affected by the state of affairs in regions of the atmosphere more than 25 miles high. On the other hand, since there exists all over the world a connection between auroræ and terrestrial magnetic disturbances, we might expect that a magnetic storm in any latitude would influence the ease or difficulty of propagation of electric waves over long distances.

### Source of Strays

One of the most interesting points suggested by this communication is the exact source of the strays received in London. Usually all strays are ascribed to lightning flashes between masses of charged air or between charged air and the earth, mainly for the reason that every lightning stroke produces a stray—one of the earliest observations in the history of wireless telegraphy—and that every lightning storm within a few hundred miles of a wireless telegraph station produces strays of intensity corresponding roughly with the distance of the station. But in temperate and colder climates strays are often abundant when there are no local storms. The general result of a long series of observations was that about 70 per cent. of the strays heard at Newcastle had the same origin, and were of about the same intensity as the corresponding ones heard in London ; whence it follows that the source is at a distance great compared with the distance between the stations. This conclusion is, perhaps, to some extent confirmed by some observations of our Post Office officials to the effect that strays are simultaneously sparse or abundant at widely distributed stations in the British Isles (J. E. Taylor). So far as these results go, the discharges might or might not be extra-terrestrial. The former alternative appears unlikely to those who accept the electrical conductivity of the upper layers of the atmosphere ; and the twilight and eclipse phenomena point to a source in the south, a question that ought to be settled by the use of directive antennæ.

### Vector Diagrams

Professor G. W. O. Howe thought there was a certain haziness about exactly what these surface waves, referred to by Dr. Fleming, were, and he had found that in teaching wireless telegraphy to electrical engineers it was far better to approach the subject from the electrical engineering point of view, as this, in his opinion, made it a little clearer as to what the problems were that had to be solved. In an ordinary long-distance telephone transmission there were two parallel wires, and at one end there was some source of alternating current, and in the distance, perhaps two or three thousand miles away, a load. It was easy, by means of the usual Vector diagrams, to work backwards and find at every point the current and potential difference between the line, and in that way they could find that at one point of the line the current was going in one direction, and at another point in the other direction, and also could work out the variation in the current at different points. There was a negative charge at one point, then a positive charge, then a negative charge, and so on, and between them an electrostatic field.

### Dr. Eccles' Theory Supported

Lord Rayleigh said that he had always, since he first heard of the wonderful results obtained by Marconi in signalling across the Atlantic, felt that there was a difficulty in explaining long-distance radio-telegraphy on the hypothesis that the earth was a perfect conductor and the air a simple dielectric, and that this was so seemed now to be accepted. Some authorities, however, professed to be unable to see the difficulty. One, for example, had pointed out that the lines of electric force were necessarily perpendicular to a conductor, and

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thus occupied to the earth exactly the position they should have for the propagation of a wave around it. The same argument might, however, be applied to sound. Here the direction of motion was necessarily perpendicular to the surface of any solid body encountered, and thus, on the argument stated above, exactly in the direction necessary for the progagation around the obstacle. From this analogy it would be evident that the suggested explanation was inadequate. We had curious anomalies between day and night transmission, and between signalling north and south and east and west, and he thought the phenomena were, therefore, too complicated to be explained by Sommerfeld's surface waves, and he (the speaker) was inclined to look more to Dr. Eccles' theory. The complication in question seemed more likely to be due to changes going on in the atmosphere. He had been struck by the fact that the receiver and transmitter were differently arranged. This seemed in conflict with the principle of mechanical reciprocity, which was very generally valid. This principle was, however, based on the linearity of the relationships involved, and might not hold when the disturbances could not be treated as very small. It was here, perhaps, that the reason was to be found for the apparent fact that the best receiver was not also the best transmitter, as would be expected from the principle of reciprocity.

### Sunrise and Sunset

Professor A. E. Kennelly, who spoke next, exhibited some diagrams showing the effect of sunrise and sunset and the difference in the strength of the signals by night and by day. To explain the effect of sunrise, the speaker said that the conductivity of the atmosphere exposed to sunlight depended upon the pressure. With air at a pressure of $\frac{1}{10}$ mm. the conductivity was comparable to that of a good sulphuric-acid solution. Lines of equal pressure in the upper regions of the atmosphere were also of equal ionisation. Hence with the sun vertical these lines of equal ionisation would be level surfaces, and this would still be approximately the case if the sun rays were inclined at any angle substantially below the grazing angle, though the levels would be higher. At sunrise, however, the rays meeting the earth tangentially, the surfaces of equal ionisation rose up sharply, so as to meet these rays nearly perpendicularly, and he suggested that this sharp bend upwards of the surfaces of equal ionisation might be responsible for the sunrise effect.

### The Analogy of Sound

Professor A. G. Webster thought a better conception of the difficulty of the problem of long-range wireless telegraphy would be obtained if they thought of sound, the transmission of which was so dependent on the homogeneity of the atmosphere. A siren might be audible 10 miles away, and inaudible at a distance of a couple of miles, though the eye could see the steam escaping from it. In radiotelegraphy the atmosphere, in view of the local effects of sun and weather, could not be expected to act as if it were homogeneous. To the mathematician, however, the subject was a diffraction phenomenon, but he treated it from the view of diffraction taken in books of optics, which was the kind convenient for mathematical treatment. In the case of sound, however, mathematics had proved quite incapable of determining the maxima and minima of sound round a megaphone, and the problem in radiotelegraphy was more complicated than it was in that of sound. With sound they had to deal with a scalar quantity, but in wireless telegraphy with a vector. It was, however, apparent that if the earth were a bad conductor, they were going to lose a lot. Moreover, the sea was homogeneous and the land not, so better transmission was natural over the former. The fact that daylight affected the transmission showed that there was a lot going on above the surface. The difficulty of the mathematician arose because the variables involved were complex quantities, and not real, as in the case of sound. Professor Sommerfeld had accordingly been obliged to make certain simplifications, and the question arose as to whether these were legitimate. It was true, of course, that he was a mathematician of the greatest skill. The analogy which Professor Fleming had drawn between Sommerfeld's two kinds of waves and the three kinds of earthquake waves was, the speaker thought, fallacious. The three earthquake waves all travelled with different velocities, but Sommerfeld's two waves had the same velocity. In all this work, however, the speaker thought it was marvellous the way in which Clerk Maxwell's equations were confirmed by experiment. He agreed with Professor Fleming that co-operation might do a lot to elucidate the question.

### Wired Wireless Telegraphy

Major Squier, who was next called on, said that the United States War Department had thought it of interest to investigate the possibilities of what he might call wired wireless telegraphy, using frequencies much smaller than those used in wireless telegraphy and much higher than were used in ordinary telegraphy. The plan was to make their antennæ stretch the whole distance between the sending and the receiving station, and to pick up the signals there

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by apparatus of the " wireless " type. It was found necessary to have some generator capable of yielding a sustained series of oscillations. This generator had a frequency of 100,000 cycles per second, but the machine could be run to give as little as 20,000 cycles per second. Driving this machine with a storage-battery, oscillation at the above rate could be sustained for hours at a time. The lines used in transmission were of known impedance, but, on putting the plant to work, it was found that the inductance was increased, and capacity had to be added to establish resonance. Making use of previous experience in wireless work, it was found quite easy to get good results. For a range of 400 miles the energy needed was very small as compared with ordinary radio-telegraphy, the line between Baltimore and New York being operated easily with 40 or 50 volts. The frequency being far beyond the limit of audition, it was possible to telephone simultaneously along the same wire by the ordinary battery system. A Fleming valve was used as a rectifier at the receiving end, and duplex telephony was easily practicable, one set of instruments being operated with these rapid oscillatory currents, and the other by the ordinary battery system. There was no interference whatever, and daylight did not have any prejudicial effect.

### Some Anomalies

Mr. S. G. Brown said that in 1899 he had made many experiments in directed wireless telegraphy and in these he met with many anomalies. At times the transmission would, after being difficult, suddenly brighten up enormously without apparent reason. He stated that he had now produced a telephonic receiver which was twice as loud as the best Bell instrument yet made. With the latter, the sounds produced by the wireless waves were so faint that an ordinary person failed to hear them at first. He had also now got a relay which would pick up signals otherwise quite inaudible.

### The Resistance of the Earth

Professor Baily remarked that Professor Fleming had recalled that the speaker had suggested some years ago that surface waves might be responsible for the long ranges attained in wireless telegraphy, and he believed that, whatever the relative value of Sommerfeld's and Eccles' hypotheses, these waves must actually exist, though as to how far they extended was another matter. He had made a number of experiments to determine the resistance of the earth, which showed that for a depth of several miles this was comparatively high, but even very slow oscillation would not penetrate to a depth of more than 50 to 100 miles. This was so little compared with the diameter of the earth that the latter might for ordinary purposes be taken as a conductor. At a depth of about 60 miles the conductivity increased very rapidly, so that below this limit the earth was a very good conductor.

## A Musical Analogy

THE immense hold which wireless telegraphy has made upon the public interest is evidenced by the numerous allusions which are to be found in the whole range of present day literature, and in its effective use by many of our most eminent speakers to emphasise the point of their discourse for their hearers. As a particularly noteworthy instance must be mentioned the speech of Dr. William H. Cummings, which was made at a dinner given by the Authors' Club to the distinguished musician. In answering the toast of his health he spoke at some length on the birth of orchestral music, and in concluding his remarks pointed out that we were at present only on the fringe of the perception of sound. Much had yet to be learned, and John Stuart Mill's fear that the possibilities of our diatonic scales were exhausted, and that it would be impossible for composers to produce new music, had been proved by experience to be fallacious. As to the future of music, Dr. Cummings expressed the opinion that great discoveries and advances seemed inevitable. Already they noted that vibrating atoms had some mysterious attraction for each other; this was evidenced in the employment of wireless telegraphy. Probably the atom vibrated in harmonious ratios, and therefore they mutually attracted. Some day, perhaps, aided by electricity and newly-invented magnifying receivers, we might be able to hear and admire the symphonies and harmonies of the heavens. Space was all a-quiver with waves of radiant energy of various lengths which constituted the harp of life. We vibrated in sympathy with a few strings here and there: with the tiny X rays, actinic rays, light waves, heat waves, and the huge electro-magnetic waves of Hertz and Marconi; but there were spaces, numberless radiations, to which we were stone deaf. Some day, a thousand years hence it might be, we should know the full sweep of this magnificent harmony, and with it we should vibrate in accord with the Master Musician of it all.

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## Canadian Notes

THE annual report of the Marconi Wireless Telegraph Company of Canada, Ltd., opens with the announcement that the new contract with the Canadian Government was completed on April 5th, 1912. This contract places the company in a much more satisfactory position with regard to the stations owned by the Canadian Government in the Gulf of St. Lawrence and on the Atlantic Coast, securing to the company, as it does, the control, operation and proceeds of these stations for a period of twenty years, and, in addition, an increase in the total amount of subsidy paid by the Government for this service.

With regard to the stations owned by the Newfoundland Government, negotiations have been in progress during the entire year. In December, 1911, a representative of the company visited St. John's and obtained the assent of the Government to the Company's proposal. Further negotiations were necessary before a satisfactory form of agreement was obtained, but advice has recently been received that the Government has now accepted the agreement in its present form, which is entirely satisfactory to the company. The agreement mainly provides for the operation of several new stations for the Newfoundland Government on the Labrador coast, and for the extension during a further term of ten years of the existing agreement protecting the Marconi Company's exclusive rights in Newfoundland until the year 1926.

The shore stations now operated by the company on the East Coast of Canada under these two agreements are as follows :—

Labrador stations owned by the Newfoundland Government and operated by the company: Battle Harbour, Venison Island, American Tickle, Domino, Grady, Indian Harbour, Holton, Cape Harrison, and Mokkovik.

Newfoundland station owned and operated by the company under contract with the Newfoundland Government: Fogo.

Gulf of St. Lawrence stations owned by the Canadian Government and operated by the company: Belle Island, Point Amour, Point Rich, Harrington, Heath Point, Fame Point, Cape Ray, Magdalen Islands, Cape Bear, Clarke City, Father Point, Grosse Isle, Quebec, Three Rivers, Montreal.

Gulf of St. Lawrence stations owned by the company and operated by the company under contract with the Canadian Government: North Sydney, Pictou.

Atlantic Coast stations owned by the Canadian Government and operated by the company: Cape Race, Cape Sable, St. John, N.B.

Atlantic Coast stations owned and operated by the company: Halifax, N.S., Sable Island.

Transatlantic station owned and operated by the company: Glace Bay, N.S.

The traffic receipts for ship-to-shore business have continued to increase, as has also the inter-station traffic handled by the company. The total receipts for the portion of the company's business amounted during the year to $45,367.42, showing an increase of $2,677 over the previous year. Every endeavour is being made to extend this branch of the company's business, and the latest returns indicate that a much larger increase in receipts will be obtained from this source during the current year.

The number of vessels equipped with the Marconi system at the date of the last annual meeting was 536. While not in a position at the moment to give the exact number of vessels equipped at the present date, the directors feel that they are well within the mark in stating that the number has at least doubled during the interim.

During the present year the capacity of the Glace Bay station has been increased, and it is estimated that the traffic receipts will provide for current expenditure hereafter. It has been considered necessary to erect a duplex receiving station at Glace Bay. The initial cost of this duplex station will be about $75,000. The cost of operation of the combined station will be increased by about 20 per cent., but the capacity and the traffic receipts will be at least doubled.

Another agreement of almost equal importance is one between the British Marconi's Wireless Telegraph Co., Ltd., and the Marconi Wireless Telegraph Company of America, and the Western Union and Great North-Western Telegraph Companies. This agreement particularly bears on this company's Transatlantic business. The Transatlantic business of the company has in the past year been subjected to very close competition by the Land Telegraph Companies of Canada and the United States, which are all affiliated with various cable companies. The agreement with the Western Union and Great North-Western Telegraph Companies now provides for their handling Transatlantic Marconigrams, and for the acceptance and delivery by the telegraph companies' lines, offices and messengers on the same terms as those enjoyed by the cable companies. It is evident that as soon as the

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capacity of the system has increased it will be possible to obtain sufficient traffic to greatly augment the revenue from Transatlantic business.

The company's system of stations is now being rapidly extended to the Great Lakes. The necessity for stations on the Great Lakes for ship-communication purposes has been urged on the Canadian Government by the company's officials for several years, and early this year the Government declared its intention of erecting a chain of stations to connect from Montreal to Port Arthur. The requirements of the Government were carefully considered by the company's engineers, and all the most modern features in wireless telegraphy are being embodied in these stations. The Government considered it advisable to have these stations operated under an extension to the contract of April 5th, 1911. A draft agreement has been prepared, satisfactory to both parties, and the Government has signified its intention of completing this agreement on the return of the Canadian Ministers from England. It provides at present for the operation of four stations, the payment of $3,500 per annum per station to the company, and for the company to retain for its own use a proportion averaging 85 per cent. of the traffic receipts. Five further stations required to complete the chain will be operated under the same terms as they are completed. The apparatus for all these stations is being supplied and installed by the company.

Mr. J. H. Lauer has been appointed manager and secretary of the Marconi Wireless Telegraph Co. of Canada. He was seven years secretary-treasurer and manager of the Builders' Exchange, Montreal, prior to taking up his present appointment. The wide experience gained by Mr. Lauer in labour conditions has been recognised both by the Provincial and Federal Governments on several occasions. In 1907 he was appointed by the Hon. Sir L. A. Jette, former Lieutenant-Governor of Quebec, member of the provincial board of conciliation to represent the employees of this province in labour disputes. In August, 1910, Mr. Lauer was appointed by the Hon. W. L. M. King a member of the board of conciliation to represent the Shipping Federation under the Lemieux Act in a dispute with ship owners and carpenters, and although his decision was contained in the minority report, it was accepted and acted upon both by workmen and employers. In 1910 Mr. Lauer was also appointed representative of the Shipping Federation for the city of Montreal for the term of five years on the permanent board of arbitration to consider all grievances which might arise between the 'longshoremen and the shipping companies. In addition to all these various duties he also organised the National Association of Builders' Exchanges in 1907.

Excellent progress is being made with the erection of the new Marconi sending and receiving station at Louisburg, Canada, and it is expected that it will be ready by the beginning of December. The work of taking down the high towers at the Glace Bay station is going on, and these will be replaced with smaller steel masts about twenty in number. Extensions to the power plant are being made at Glace Bay to supply the station at Louisburg. At the new station there will be from twenty-five to forty operators employed. The Louisburg station will, when completed, work direct with Poldhu, Cornwall, and all ocean-going steamers equipped with the system.

According to advices from Toronto, the various inland lake steamship companies would welcome the establishment by the Canadian Government of powerful shore stations to operate in connection with wireless telegraph apparatus on the lake steamers. Mr. B. W. Folger, of the Niagara Navigation Co., has informed a newspaper representative that his company would be willing to equip its boats with wireless apparatus if shore stations were established. They would not undertake, though, to build the shore stations themselves.

## The Argentine Marconi Co.

The report of the Compania Marconi de Telegrafia sin Hilos del Rio Plata for the financial year ended May 31st last points out that within a short time the high-power station which the company are erecting will be completed. This station is destined to communicate direct with Coltano and other high-power stations in Europe, the United States, and elsewhere. Plans have already been prepared, and the land for the erection of the station has been acquired. It is also intended to instal a station at Punta Piedras, and another at Bernal, for ship and shore communication. These developments will ensure a direct and practical communication across the long distance between the Rio de la Plata and Europe. Mr. St. J. Steadman, who visited the country on behalf of the parent company, has assisted the company in overcoming difficulties, and there is in the report the expression of high esteem and gratitude for his services. The report continues that the important scientific experiments recently carried out by Dr. Marconi have placed wireless telegraphy on a high practical footing.

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## High-power Station at Buenos Aires

MR. SIDNEY ST. J. STEADMAN, who was sent by Marconi's Wireless Telegraph Co., Ltd., as their special representative to Buenos Aires, with the object of assisting the Argentine Marconi Company in its negotiations and arrangements with the Argentine Government for the erection of a high-power station to communicate with Europe, North America, China, Japan, and the Australasian Archipelago, gave a dinner to the directors of the Argentine Marconi Company and others on September 25th in celebration of the success of his mission. Among the guests were General Gregorio Velez, Minister of War, and Rear-Admiral Saenz Valiente.

In proposing the toast of the evening, Mr. Steadman alluded to the increasing population of Buenos Aires, now nearly 1,500,000, and to the extreme importance of its commercial as well as geographical position, and to the great volume of its agriculture, trade and shipping, and he acknowledged the cordial response which he had met with from the Ministers and principal officials of the Argentine Government, and particularly from the experts in radio-telegraphy employed by the Government.

Sir Reginald Tower, British Minister to Argentina, congratulated the directors of the Argentine Marconi Company upon the authority which they had obtained to erect the high-power station, as the result of which he anticipated that great benefits would be bestowed upon Buenos Aires and the republic.

The chairman of the Board of Directors of the Argentine Marconi Company, in responding to the toast of the evening, gave it as his opinion that the high-power station would be open to public service in less than twelve months from the present time.

Mr. Steadman mentioned that he had specially arranged, at the request of the Minister of Marine, that the high-power station should give every day the exact chronometrical time to ships at sea 1,000 miles south of Buenos Aires, and including Cape Horn, thus reducing shipwreck and loss of life.

## A Pacific Coast Station

THE 25-kw. Marconi station being equipped near Fauntleroy Park, Seattle, will be ready for operation shortly. The station has a 320-foot tower and will be the most powerful on the North Pacific. The aerials consist of eight sections of eight wires, requiring nearly nine miles of wire. During the tests of the station, messages being sent by the Pacific Mail steamer "Mongolia," 320 miles west of Honolulu (a total distance of 2,700 miles) were easily picked up, and the wireless station at Olongapa, in the Philippine Islands, was heard working with vessels plying out of ports in the Orient. The equipment is so arranged that any part or all of the aerials may be used in transmitting or receiving messages. They may be tuned down to work with the steamers plying on Puget Sound or given power to get into communication with vessels plying the Pacific or with stations in Alaska, the Orient, or along the California coast.

## Machine Tools for Experimenters

THE Engineering and Machinery Exhibition, which was open from the 4th to the 26th October, was remarkable for the collection of various machine tools brought together. The chief interest centred in the various working exhibits in the main area, where nearly every prominent firm of tool makers in this country showed lathes, shapers, wood-working machinery, boring mills and automatic machines operated as nearly as possible under their ordinary working conditions, many being engaged on the execution of actual orders or on the manufacture of stock parts for their own works.

Messrs. Drummond Bros. exhibited some dozen small lathes and other machines adapted equally for factory or experimental use, and the impression gathered from a visit to this attractive stand was that Messrs. Drummond have realised that the average experimenter requires machine tools of a very accurate design. That is one of the features which distinguished the tools inspected.

The Cambridge Scientific Instrument Company put forward many interesting examples of pyrometric apparatus, some in actual use recording the temperature of furnaces at work in the building. Another item on their stand was their latest type of oscillograph with permanent magnet, which can be used on 50,000-volt circuits; the ordinary sensitive vibrators can be used in this instrument or a heavier pattern which has been specially brought out for it, giving greater ease of repair.

To return to machine tools, the most marked development has taken place in the lathe, chiefly due to the use of high-speed steel-cutting tools, and to the abandonment of the cone-pulley and belt-shifting in favour of the all-gear head, so that full belt-speed can be employed for all diameters of work. The extended use of the turret head, combined with improved labour-saving devices, is another factor that makes for progress.

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## In the Arctic Circle

A MILD stir has been caused by the announcement, on October 1st, that the first wireless telegram from Dr. Mawson's Antarctic expedition in Adelie Land has reached Hobart, *via* Macquarie Island. Captain J. K. Davis, the commander of the expedition ship *Aurora*, stated in a letter to Sir E. Shackleton that, after refitting, the vessel was proceeding on a further scientific cruise, and would finally leave Hobart on December 26th to pick up Dr. Mawson and his companions. They should be due back from the Antarctic in March.

On the way out the *Aurora* will again visit the wireless station at Macquarie Island. Until the receipt of the recent telegram there had been no wireless communication between the members of the Mawson party and the Macquarie Island station.

Captain Davis reports that he spent fourteen days at Macquarie Island, and that during the whole of this period only two hours' sunshine was recorded. The little party of five men left by Dr. Mawson in charge of the station were all well, and had been in daily wireless touch with Sydney.

This is by no means the only or the first occasion on which wireless telegraphy has penetrated the Arctic circle. Reference was made in a recent number of this magazine to the voyage of a United States revenue cutter, fitted with Marconi apparatus, to the Antarctic circle, from whose frontier communication was maintained with the mainland without any difficulty. In 1909 one of the vessels engaged in a seal-hunting expedition in the Arctic icefields—the s.s. *Florizel*—was fitted with wireless apparatus. In the following year, the s.s. *Eagle* was also fitted. Wireless signalling proved to be of such valuable service during the 1910 expedition of the Newfoundland sealing fleet that, previous to setting out on last year's expedition, several more vessels were equipped with Marconi apparatus.

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H.S.H. Prince Alexander of Teck presided at the ceremony of distribution of awards to the foreign and British exhibitors at the Great White City, on Thursday, September 26th. The International Jury placed the Marconi Company in the list of principal exhibitors to receive diplomas.

## Field Stations for Siam

THE Siamese Government have placed an order with Marconi's Wireless Telegraph Co., Ltd., for the supply of two knapsack stations. This type of station is intended to replace to a large extent visual signalling, and is suitable for many purposes, including the directing of gun fire. It has a range of about ten miles, and is carried in knapsacks strapped to the backs of soldiers. Four men, each carrying a load of between 20 and 30 lbs., are necessary to carry a complete station. A single mast, of extremely light though rigid construction, made chiefly of aluminium tube, is used to support an umbrella form of antenna, the antenna acting also as stays to the mast. The source of energy for a knapsack station may be either a primary or secondary battery, according to choice. If the latter be employed it is necessary that the accumulators should be systematically charged as required, and for this purpose a special field charging set which has a sufficient output to serve ten or twenty such stations, is made. These two stations are not the first portable stations which have been supplied to the Siamese Government, for in November of last year we described a series of demonstrations with portable stations which had been carried out in Siam. The accompanying illustration shows a group of Siamese officers and soldiers who are engaged in carrying out the demonstrations referred to.

*Siamese Officers and Soldiers engaged in working portable stations.*

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A musical authority suggests that wireless installations may bring new music to this planet If it could be managed before the pantomime season we might yet escape the threatened deluge of ragtime.—*London Opinion.*

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## Meteorological Notes

So much progress has been made in getting Atlantic meteorological observations by wireless telegraphy that it has now become possible to add enormously to the area of the maps published in the weekly weather report. Until the close of last year the illustrations were limited to Europe and Algeria, but with 1912 the area has been extended westward so as to include the greater part of the Atlantic, from Iceland down to the Canary Islands, nearly the whole of Canada, and a large slice of the United States.

Over this vast region we can, with comparative ease, follow day by day the march of areas of cyclones and anticyclones.

As a general rule the systems move from America towards the south-east, east, or north-east, but there are many exceptions, not a few of the changes we experience in this country coming from the eastward instead of from the Atlantic. It is on the correct anticipation of the movements of these systems that the successful prediction of coming weather is rendered possible. On a recent occasion, while the general public were looking forward to the early arrival of a record frost, our meteorological office predicted the continuation of a very mild south-westerly type of weather on our side. This official confidence was based upon the wireless observations, which indicated pretty clearly that the situation on the Atlantic rendered it necessary for all weather systems coming from Canada to sheer off north-eastward from Newfoundland towards Greenland and Iceland, giving us their soft equatorial wind instead of their cold Polar current.

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In his report on observations made during an official visit to Europe, Asia, and America, the Australian Commonwealth Meteorologist (Mr. H. A. Hunt) makes the following remarks on the employment of wireless telegraphy in meteorological work :

" Although the question of enlisting wireless telegraphy from ocean-going steamers and other stations as an adjunct for obtaining meteorological information was persistently inquired into in all the countries visited, yet the only service that apparently has made any use of these means of communication for weather purposes is the Indian Service ; but these messages are from fixed stations, viz., at Diamond Island, Port Blair, and from a pilot boat, and, moreover, the heights and instrumental errors are definitely known. Wireless messages are also shortly expected from Slipper and Ginger Island.

" An attempt was made by Dr. Polis, director of the meteorological observatory at Aachen, while crossing the Atlantic, to make inquiries into the American service to construct daily isobaric charts on board the ' Kaiserin Augusta Victoria ' from wireless messages received both from land and sea, and some difficulties were encountered.

" However, at the International Conference held at Innsbruck in September, 1905, Dr. Shaw promised to make inquiries into the whole question, and he presented a report to the meeting of the science committee at Paris two years later, which generally voices the opinion and position of the subject in Europe. The inquiry resolved itself into two distinct parts :— (1) The administrative part.—The number of ships equipped with wireless telegraphic apparatus, and the terms upon which messages can be procured. (2) The meteorological part.—The arrangement of the meteorological message and the means of avoiding or detecting errors in observations or transmission. As regards (1) Marconi's Wireless Telegraph Co. publish regularly a list of ships with which communication can be made by wireless telegraphy through the agency of the ordinary telegraphic service of the post-office.

" The ordinary cost of messages is at the rate of 6d. per word, with a minimum of 6s. 6d. per message. At the rate of one message per day this works out at about £120 a year. We ought to aim at four or five messages per day at least, which would cost, say, £600. Probably we ought to expect to pay a sum approaching £1,000 for a service that would extend the effective area of our daily charts to the meridian of 15 degrees or 20 degrees W. of Greenwich, which is perhaps the range that we might expect to cover without retransmission of the messages."

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We recently witnessed a remarkable series of fire extinguishing demonstrations with the well-known Kyl-Fyre Extinguisher. Petrol burning in a pail, on the ground, and in a pit of tar was extinguished instantly, whilst the manner in which the conflagration of a large wooden structure containing about 1,000 ft. of battens was extinguished after it had been allowed to get well alight supported the claims of the makers that the Kyl-Fyre extinguisher affords permanent protection from fire. The extinguisher should be of inestimable value where petrol engines and electrical machinery are used, as the powder which forms the extinguisher cannot harm the most delicate machinery, and, in addition, is a non-conductor of electricity.

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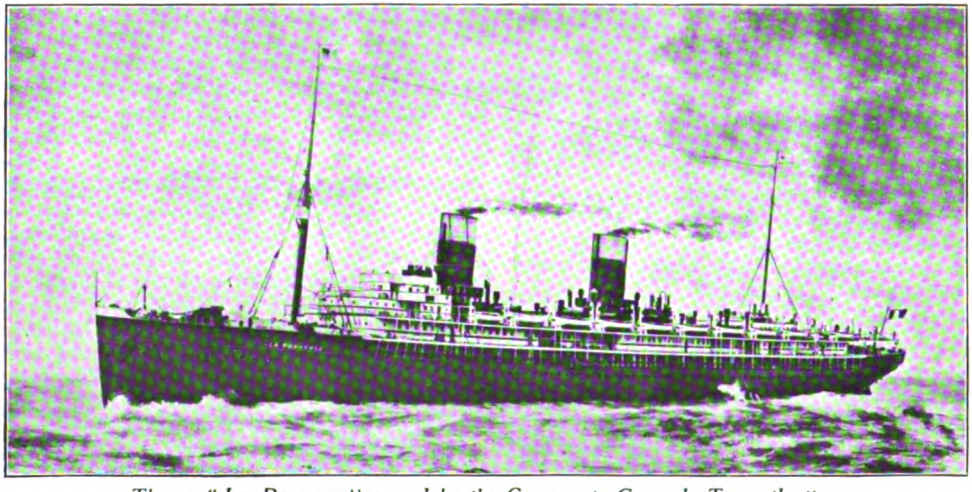
# Maritime Wireless Telegraphy

ONCE again wireless telegraphy has proved the means of saving life. Again it was a ship that was in danger of destruction, but this time it was not the winds or waves or floating berg that menaced the vessel; it was, perhaps, a greater peril than them all—it was fire—for when the flames break out little can be done to stop their ravages, and choice has to be made whether it shall be the cruel death by fire or the lingering death of exposure in an open boat with only a feeble hope of rescue. The steamship "Berkshire," belonging to the Merchants' and Miners' Transport Company, was voyaging from Savannah to Philadelphia with a large cargo of cotton and more than a hundred passengers on board. When she was a little north of Cape Hatteras fire broke out in the hold, and, owing to the inflammable nature of the cargo, it had assumed serious proportions before any attempt could be made to put it out, and when at last fire extinguishing apparatus was in working order the flames had taken such a hold on the vessel that the efforts of the crew were unavailing. All Friday night was spent in vain endeavour to save the ship. Holes were cut in the hatches and steam forced into the holds at high pressure. Meanwhile, the captain, seeing that fight was hopeless, gave the order to steam full speed ahead and make for Norfolk, Virginia, the nearest port, as it was impossible to beach the vessel anywhere in the neighbourhood of Cape Hatteras owing to the wild and rocky nature of the coast. Meanwhile repeated calls for aid were sent out by wireless, and these attracted the attention of the "Apache," of the Clyde Line, and other steamships, who were sent hurrying to the rescue. The "Apache" was the first to arrive, just as the captain of the "Berkshire," in order to avoid a panic, had ordered the passengers to take to the boats. It was not a moment too soon, for the flames were rapidly destroying the vessel. Later, the "Berkshire" was steered to a small cove and flooded with water, but only the hulk remains, as the body of the ship had been practically burnt out.



*The ss. "La Provence," owned by the Campagnie Generale Transatlantique*

The following vessels have this month been equipped with Marconi wireless apparatus. The India Office has two troopships, the "Dufferin" and the "Hardinge"; the one left Southampton this month for Bombay and the other for Karachi. Five boats of the P. & O. Steam Navigation Company have been fitted: the "Sumatra," "Simla," "Novara," "Plassy," and "Malta." All except the "Plassy" are passenger steamers, the "Simla" and "Malta" destined for Calcutta, and the "Novara" and "Sumatra" for Japan. The "Plassy" is at present being used as a troop-

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ship, and was due to arrive at Bombay on October 31st.

The Royal Mail Steam Packet Company have one vessel, the "Darro," leaving Liverpool for Buenos Aires on November 8th, which has been fitted with the 1½-kw. emergency apparatus. Emergency apparatus has, however, been installed on two more of their ships, the "Thames" and the "Trent" (both of these vessels left Southampton in October and are bound for the West Indies); while another, the "Arzilla," has been fitted with ½-kw. and emergency apparatus, a plant especially adapted for use on cargo vessels, to which class she belongs. Her destination is Morocco. By order of the Adelaide Steamship Company, wireless has also been installed on the "Wandilla," engaged in trade around the Australian coast.

Several vessels plying between the United Kingdom and South America have likewise been fitted with complete wireless equipment. These include "La Correntina," of the Houlder Line, sailing for Buenos Aires; "Mandingo," belonging to Elder, Dempster & Company; and the "Kenuta" and "Junin" of the Pacific Steam Navigation Company. These two last vessels are due to reach Valparaiso in November, while the "Mandingo" is destined for Lagos. The Compania Mexicana de Petroleo have also been supplied with wireless for their oil transport, the "Cernicalo."

The commissions for all these vessels, excepting the cases specially mentioned, are for the 1½-kw. and emergency plants. Orders have also lately been received by the company to fit two cargo ships in course of building with the ½-kw. and emergency set, and 50 vessels of the Ellerman lines. Of these we hope to publish further particulars in December.

The committee of "Lloyd's Register" have just issued their annual shipping report. As usual, the information in this volume is very complete, and a careful study of the statistics contained therein is by no means a profitless labour. It is particularly interesting to note that the number of vessels fitted with wireless apparatus continues to increase, for the entries in the society's register up to June 30th of this year reach a total of thirteen hundred and ninety-two.

We referred in our September issue to the order received for equipping the s.s. "Mongolia" with wireless apparatus. The vessel has now been purchased by the Australian Government for their coast trade, and the name has been altered to "Western Australia."

There is a reminder of the progressive spirit which characterises the younger members of the Empire in the Australian Navigation Bill, of which the second reading was adopted at Melbourne on September 12th without a division. The provisions of this measure, dealing with compulsory boat drill, the equipment of wireless installations, and the like, were drafted before the "Titanic" disaster brought its rude awakening. It was passed by the Senate last year, but no one at that time dreamt that there would be such sad demonstration of the need of fresh regulations. In the case of many calamities the only consolation is that they provide lessons for the future. A long period of immunity from accident always encourages the hope that this will continue. When the disillusionment comes it is a great shock, and acts as a stimulus to speedy improvements. The steamship companies themselves are particularly anxious to take all possible precautions for the safety of passengers. Apart from humane considerations, they would do so in their own interests, and the steps which are being adopted on all sides are distinctly reassuring.

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The linking up of the whole British Empire by means of wireless stations is a matter that commanded early discussion and urgent advocacy in the columns of the *United Service Gazette* when wireless installations were first placed on board His Majesty's warships, but the *Gazette* went further, and pointed out at that time that it would be possible, if every British merchant vessel classed A1 at Lloyd's was compelled to carry a wireless outfit as a part of her navigation safety arrangements, to make this a link in a system whereby all parts of the seven seas could at all times be kept in close contact with all five continents inhabited with civilised human beings. To-day we are getting very close to that ideal, when all our warships are being fitted with wireless apparatus, and we are within sight of the period when all ships of importance in our mercantile marine will be in a position to take in and send out or repeat wireless messages. When this is accomplished deep will call to deep in a way never before anticipated, and by direct and repeated messages the Admiralty or the owners of merchant vessels should be able at any time to "speak" one of their ships on any part of the high seas. With eyes and ears of this kind operating in time of war there would be no more wild chases after an enemy, such as Nelson experienced when he was pursuing his opponents in the Mediterranean and the West Indies.

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## The Telegraph in Fancy and Fact

ALL scientific discovery has had its origin in fancy. Long before investigation had proved the existence of the forces which were to work the magic, some great mind, projecting itself into futurity, would leap to a conclusion, and the dream would be conceived.

Such visionary science brings with it little comfort to the dreamer, for the workaday world occupies itself only with definite results, and troubles little about what may be. So truths, yet to be proved, are thrown back to the dreamer by the incredulous crowd which good-naturedly, but recklessly, dubs him another Don Quixote, tilting at scientific windmills. But in time the perspicuity of the dreamer is vindicated. Other men, perhaps not such original thinkers, but men with keen intellects and tireless energy, appreciate the theory and set themselves to prove its correctness, with the result that, after laborious research, the theme which was once the airy nothing of its pioneer takes up a local habitation and a name, and becomes an important factor in the work of the world which scorned it.

* * *

The progress of telegraphic discovery followed much upon the lines indicated above. The idea of setting up communication between man and man over vast distances is one that reaches far back into the ages: how far it is hazardous to guess; but that it was present in the mind of primitive man may be gathered from the fact that some of the cannibal tribes of interior Africa are known to have constructed with rubber and bamboo twigs an instrument which, when struck, gave out a musical note of great sweetness. Various tones could be produced on the instrument, and in the silence of the African forest a note would carry for a distance of from five to seven miles.

* * *

Certainly a distinct means of communication must have been established early in the world's history, for records are extant which tend to show that Menes the First, who reigned over Egypt about B.C. 5865, established in his Government a Department of Intelligence. It would be interesting to know how intercommunication between the parts of the Empire was effected. Possibly by a system of fire or heliography, but if any other means were used they were lost in the confusion which followed the dismemberment of the great empire, and more than forty centuries passed away before any other means than that of signal fire was adopted.

The discovery of electricity first suggested the idea of finding a means of using this power for the purposes of communication, and as early as 1729 Gray was experimenting with conductors, and not long after Lollett succeeded in sending a shock along a line of men and wires about 900 ft. long. Then in 1745 Bishop Watson, of Llandarf, proved, by sending a shock through 1,200 ft. of wire, that transmission was practically instantaneous. This was the first intimation of the speed at which electricity travelled.

The first idea to apply practically the intelligence thus gained appears in a letter written in 1753 to the *Scott's Magazine*. The writer suggested a series of insulated wires equally numbered to the letters of the alphabet with marked balls, or alternatively light bells of different tones, suspended from the ends of the wires. The vibration caused by the electric current would indicate the message. But it was not until 24 years later that the hint was acted upon.

* * *

Let us turn, however, from the electric telegraph to a system of telegraphing which arose in the latter part of the eighteenth century, and bid fair to eclipse that of electric transmission. This was the semaphore, invented by Claud Chappe. The plan consisted of mounting on a high tower an upright post, to which pivot horizontal bars or arms capable of being placed at various angles were pivoted. The movements of the arms would indicate different letters, numbers, words, or sentences, and there could be 98 such movements. The towers were to be placed short distances apart, and so an effective method of semaphore transmission arranged. The French Assembly of 1794 was the first to adopt this system for Government use, and their example was followed by all the important Governments of Europe. The most important line was constructed from the Austrian frontier through Warsaw to St. Petersburg by order of Nicholas I. It covered 1,000 miles, and cost several millions of pounds.

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This expedient acted rather as a set-back to electric enterprise, for although Reusser in 1794 suggested a method by which a current would illuminate the letters of the alphabet, etc., and Cavallo in 1795 went a step farther by suggesting a combination of sparks and pauses, little interest was taken in the matter. Bentancourt, however, should not be forgotten. In 1796 he constructed a single wire from Madrid to Aranjuez, a distance of 20 miles. The current was generated by Leyden jars, and the reading was effected by the diversion of pith balls. A little later only one wire was used in operating the apparatus. Here, again,

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affairs were brought to a standstill by the lack of interest. For instance, the British Post Office, when approached on the idea of substituting the one-wire pith-ball system for the semaphore, issued the reply that " Telegraphs of any kind are now wholly unnecessary, and no other than the one now in use could be adopted."

* * *

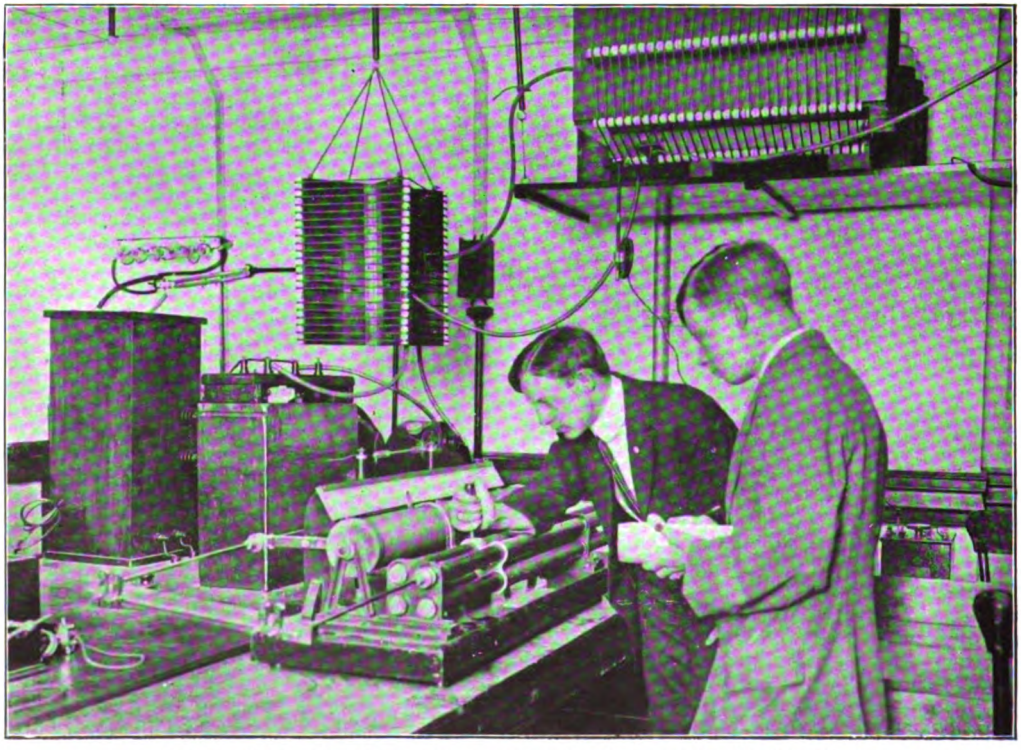
Telegraphy, however, was soon to receive its greatest impetus. On April 27th, 1791, was born Samuel Morse. In 1832 this clever man, who was by vocation an artist, became interested in telegraphy through a Dr. Jackson, who described to him some experiments in electricity which he had witnessed in Paris.

Morse was fired with enthusiasm for the possibilities of electricity, and before many days had passed had devised a full set of instruments to carry messages, and had formulated a code; but it was not until 1837 that the patent papers for the invention were filed. Interest was created on his behalf in the Washington Congress, and money voted for building an experimental line of telegraph. After several failures the line was, with the help of Ezra Cornell, completed, and with Morse at one end, and his friend and helper, Vail, at the other, the famous message, " What hath God wrought," was successfully transmitted and received.

The first commercial use, however, of the electrical telegraph was the announcement sent from Baltimore to the Congress at Washington, that James K. Polk had been elected to the Presidency.

* * *

But Morse did not stop at perfecting the telegraphic code. He was convinced of the possibility of establishing a means of telegraphic communication without wires, for, writing on December 23rd, 1844, to the Secretary of the United States Treasury on the subject of his experiments, he remarked: " The simple fact was then ascertained that electricity could be made to cross a river without other conductors than the water itself." Many years were to pass, however, before such an idea, despite various efforts made in this direction, could be realised. Professor Hertz's discovery of electro-magnetic waves in 1887 was the prime mover in bringing about the final achievement of wireless communication established by the inventive genius of Marconi.



*Pupils studying the Fleming Cymometer at the Marconi School in New York.*

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## Monthly Miscellany

In the course of the debate in the House of Commons upon the report of the court of inquiry into the loss of the "Titanic," Mr. Buxton, the President of the Board of Trade, said he thought the time had come when wireless should be compulsory on passenger ships, and, perhaps, on a certain class of cargo ship. He had had a Bill prepared dealing with the subject, and had only postponed its introduction because of international negotiations which were taking place, but he would not postpone it further if those negotiations were unduly delayed. Mr. Buxton suggested that compulsion would be accompanied by some assistance in the way of getting installations at lower cost, and he hoped, when he introduced the Bill, to be in a position to make an announcement upon that subject which would be calculated to reassure the ship-owning interests.

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It has been announced that the most important resolution passed by the German Seamen's Conference, which recently concluded, is that wireless telegraphy shall be installed upon all passenger steamers carrying at least 75 persons, including the crew, as well as upon all trading vessels carrying at least 60 persons. The telegraphic installation is to reach at least 100 sea miles. As this decision involves an alteration for the current regulations regarding the prevention of accidents at sea, it requires the assent of the Imperial Insurance Office, which will doubtless be given. The present step does not anticipate the measures that may be proposed at the International Conference for the discussion of safety at sea which is to be held, and which is expected to adopt further provisions relating to the installation of the wireless system. The decision passed by the Seamen's Conference does not apply to German steamers cruising in home waters or in the Mediterranean, but only to those sailing across the Atlantic and farther afield.

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Others besides military and naval authorities are finding a use for wireless. Mr. Max Allen has put "a real Marconi installation" to effective purpose in a drama entitled "For Love and the Navy," which has been successfully produced at the New Middlesex Theatre, London. There are sufficient thrills to satisfy the most *blasé* sensation taster, and the pulse is quickened to fever pitch by the tap, tap, tap of the key sending off its message of love and hate and all the other ingredients of melodrama.

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Since the United States Government appointment of Miss Mabel Kelso to the position of wireless operator on the liner "Mariposa," at San Francisco, and also the opening up unofficially of wireless telegraphy to women operators both in Canada and the United States, the question has been raised at Congress as to whether a woman should be entrusted with the protection of lives in this responsible position. The Department of Commerce and Labour, at the time of Miss Kelso's appointment, held that there was nothing in the present law to prevent women from assuming charge of a wireless apparatus. Miss Edith Coombs has been appointed wireless operator on the steamer "Roanoke" which sailed recently from San Francisco to Portland and Astoria. Miss Coombs is the second woman operator on the Pacific coast. It appears that there has been some opposition to Miss Coombs going to sea as a wireless operator on the ground that gallantry on the part of the men of the vessel would not allow her to remain at her post during an accident. But Miss Coombs insists that the travelling public need have no fear as to their safety on her account, as she has decided to remain at her post of duty until "the last flickering spark of electricity" can be sent from the vessel. If necessary, she declares her intention to remain on board with the captain until the last soul has been cared for and the signals of distress sent. "Ladies first" will not apply to Miss Coombs.

* * * *

It was an ill day for evildoers when wireless was invented. Many a criminal had been able to escape the punishment that was his due by a speedy voyage across the expanse of water. Had he stayed on land telegraphy and the whole machinery of the law would, in all probability, force him to disclose his secret, but in a Transatlantic voyage (and that was the usual route taken by malefactors) the only dangers to be guarded against were—one, recognition, and the other the report of the crime reaching the ship on which the criminal had chosen to escape. It was easy enough to evade the former possibility, and as for the latter, well, when once the boat had weighed anchor it was ten chances to one that nothing more would be heard of the criminal. But, as Monsieur le Medécin remarked in Molière's famous play, "Nous avons change tout cela."

* * * *

A passenger vessel is as much in communication with the affairs of man on the high seas as it is lying in the harbour, and the arm of the law can use this invisible power to bring the wrongdoer to justice. An instance of the potency of this detective weapon was supplied by a famous murder case, and not long ago an Italian captain used this means to secure some notable criminals whom he found were pas-

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sengers on his boat, so that some gentlemen who for a long time had been wanted by the Italian police found that quite a little reception had been arranged to welcome their arrival at their journey's end.

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Now another case has just come to light, but this time the drama was enacted across the Herring Pond, and the *dramatis personæ* were the representative of an Italian house and a stylishly dressed young man of Toronto. The former, while at Toronto, had occasion to seek advice with regard to cashing a letter of credit. As a result his pocket was shortly afterwards deftly picked, and he found himself almost penniless. There was only one thing to be done—to return home and explain to his firm, and forthwith he booked steerage passage on the "Oceanic," and looked forward to a dull passage home. But the voyage was not to be so dull as he imagined, for shortly after he left New York he chanced to espy the man whom he had every reason to suspect of being the thief strolling the second-class section of the ship. It was not long before he told his tale to the captain, and, with the connivance of the ship's company, he that night resumed his acquaintance with his amiable friend. The circumstances were rather dramatic; in fact, only the intervention of onlookers prevented the battle becoming more than one of words. However, it was pretty evident that the victim knew his man, and in the end it was decided to send a Marconigram to Plymouth, with the result that when the "Oceanic" arrived there on October 19th there were detectives ready to receive them and to take them to a police station, where the accused man was detained.

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The up-to-date hostess has also discovered the advantages of wireless, for as she voyages over the high seas she invites her guests through the medium of the invisible ether, and makes all necessary arrangements for a little dinner party to take place as soon as she arrives at her destination; only, if the experience of Mrs. Frank Gould teaches anything, it is that the Customs authorities have to be reckoned with. Mrs. Gould, it will be remembered, had made arrangements by wireless for a dinner party, which was to take place on the evening of her arrival in New York. She was prepared for any social emergency, for had she not in many trunks thousands of pounds' worth of Parisian confections? The only trouble occurred on landing, when the New York Customs officials detained the whole of the baggage of Mr. and Mrs. Frank Gould and their party. Not even the smallest fraction of their contents could be landed, and the travellers were totally unprepared for such an emergency. The party had perforce to be abandoned, but wireless telegraphy was in no way to be blamed for this unfortunate *contre-temps*.

* * * *

How does the idea of engaging your servants by wireless strike you? That is the latest expedient of the ladies in New Zealand. It seems that this serious domestic problem is as little capable of solution in the Antipodes as it is in our own isle, but the brighter spirits among the mistresses of New Zealand have cut the Gordian knot of their own difficulties by a most ingenious *coup*, and as victors in the domestic fight are rewarded with the services of English maids. News reached Wellington that the "Turakina," which was due to arrive shortly from London, had on board between twenty and thirty girls willing to enter domestic service. That was satisfactory as far as it went, but the crowd of prospective employers was out of all proportion to the number anxious to be employed. When the vessel reached its destination a number of anxious matrons were waiting ready to offer employment to the new arrivals. They were doomed to disappointment. The majority of the girls had been booked long before the "Turakina" reached Wellington. The aggrieved ladies demanded how this might be, and learned to their immense chagrin that some of the more wideawake of their neighbours had sent Marconigrams to the ship, with the result that most of the girls were "placed" by this means. We are sorry that anyone should have been disappointed, but think the enterprise of the successful competitors was thoroughly deserving of reward.

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The council of the Organised Sailors' Associations in Germany have given much consideration to the question of the perfection of signals which might be used in the case of accidents at sea. News and warnings for sailors, they point out, only achieve their purpose if they reach the commander of the ships without any delay. This is especially necessary in case shore and sea signals suddenly disappear from their stations on account of storms; and reference is made to mishaps to the fireships "Sandettie" and "Haaks," the former of which was destroyed in a collision, and the latter having gone adrift. The council state that wireless telegraphy now enables them to meet all the requirements with regard to quick transmission, and they urge in the interests of navigation the desirability that news and warnings for sailors should be transmitted as soon as they are known to ships at sea by means of wireless telegraphy.

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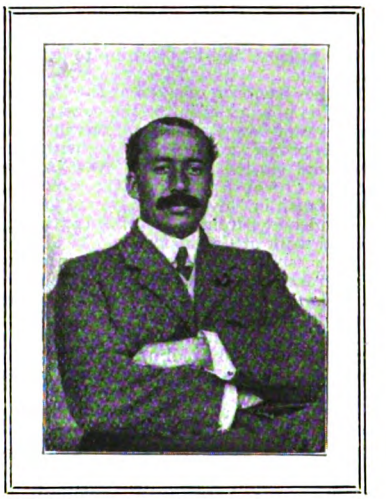
## Personal

Mr. E. W. Salis, who has been appointed to represent Marconi's Wireless Telegraph Co., Ltd., in Brazil, was born in Ireland in 1874, and is the son of the late Major-General Salis-Schwabe, C.B. He was educated at Marlborough College, and from there proceeded to take up the engineering and chemistry courses at the City of London and Guilds Institute. He worked to such good purpose that he obtained a diploma in both these subjects. On the termination of his college career he spent a short time in the business of Messrs. Salis-Schwabe, Ltd., of Manchester, until he was appointed a member of a private commission which was sent by the Home Secretary to inquire into the prison system of Siberia. Mr.

*Mr. E. W. Salis.*

Salis eagerly availed himself of this opportunity of travel, for not content with traversing the whole of that difficult country by sledge—the Trans-Siberian Railway had not then been constructed—he travelled extensively in Japan, China, and Borneo. In 1893 he returned to Russia and settled in Vladivostock, where he carried on an important business for nine years in addition to his appointments as British Commercial Agent and Vice-Consul. On the outbreak of the Russo-Japanese War he once again visited China, and acted on behalf of the Transvaal Chamber of Mines in recruiting labour for South Africa. In 1906 he was appointed manager of the Manaos Harbour Company on the Amazon, and held the position for five years, and it was during his term of office that the erection of a Marconi station on the land of the company was planned and carried out. It is not surprising that Mr. Salis, who has had such advantages of travel, should be a good linguist; he is equally at home, whether he is speaking French, Russian, or Portuguese, but his pursuit of varied knowledge has in no way eclipsed his earlier love of science.

Mr. Joseph Lewis was married at St. Mary's Church, Ealing, recently, to Miss Katherine Lilian Jones, of Canterbury. Mr. Lewis was educated at Leicester House School, Carshalton, and at the London Polytechnic. He then joined the Indo-European Telegraph Company, and after undergoing a course of training at their school was appointed telegraphist at their London office. After two years' service he migrated to wireless telegraphy, and joined the Marconi Company on June 15th, 1902, when he was sent to Crookhaven wireless station. He remained at this station for about three years, being in charge for some time. He was then appointed to take charge of the installation on the s.s. "Minnetonka," of the Allan Transport Line, and after six months' service he was sent to Trieste to assist in the fitting and to take charge of the installation on board the s.s. "Ultonia." Twelve months later he was transferred to the "Kaiser Wilhelm der Grosse," being selected for duty on that vessel on account of the exceptionally heavy telegraphic work which it was expected would result from the presence on board of the Russian Peace Envoy and numerous special newspaper correspondents who were on their way to America in connection with the settlement of the Russo-Japanese war. The trip was



*Mr. J. Lewis.*

a most successful one in every respect, and thousands of words were transmitted in the course of the voyage to the various newspapers. Mr. Lewis then entered the employ of the Compagnie de Télégraphie sans Fil, of Brussels, and was in charge of the wireless apparatus on nearly all the vessels of the great German shipping lines. During the last six months of his service with the Belgian company he was engaged as travelling inspector and instructor, and was eventually retransferred to the parent company towards the end of 1910. After making one trip on the "Adriatic" as officer in charge he was appointed junior inspector, and three months later he was promoted to the post of inspector in the London office of the Marconi Company. On the completion of a voyage to South Africa in charge of the wireless station on the "Balmoral Castle" he was appointed to a position in the London office.

Mr. Ewart James Watts, the Marconi Company's engineer in the Far East, was married on Monday, September 13th, to Miss W. Wynne, at the British Consulate, Yokohama, Japan.

Mr. A. H. Morse, late of the United Wireless Telegraph Company, which has been absorbed by the Marconi Company, has now joined the staff of the latter company. Mr. Morse was engaged in the construction of wireless stations in Canada, Alaska, and the United States of America until February, 1910, when he was appointed Superintendent of the European division of the United Wireless Telegraph Company, with headquarters in London. Prior to 1906, he was for several years engaged in the construction of ordinary telegraphs in South and West Africa.

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## Movements of Engineers

S. R. Groser has relieved E. S. D. Marden at the Canary Islands, and is carrying out extensions to the Teneriffe and Las Palmas stations.

C. H. Hughes has been transferred from the Spanish Marconi Company to the English Company, and is engaged on the erection of the Cape Finisterre Station.

B. S. Benning, from Poldhu, has been attached to the constructional staff for erection of two 200-h.p. and three 10-h.p. Marconi stations for the Chilian Government, and sails for Chili on October 31st.

F. E. Burrowes has completed the Marconi station at Port Stanley, Falkland Islands, and is now on passage home.

H. M. Burrows, from sick leave, has returned to duty in the London office in connection with the Imperial high-power stations.

W. B. Cole has completed the erection of a Double-Coil Marconi station at Porthcurnow for the Eastern Telegraph Company, and is returning to general duty in the London office.

C. E. Hughes has been relieved at the Marconi station at Vigo, and is now attached to the constructional staff on the erection of new Marconi stations in Spain.

C. James is progressing satisfactorily with the erection of the Marconi station at Accra, West Africa, to the order of the Crown Agents for the Colonies, and is expected to finish in November.

R. G. Kindersley, from Poldhu, is continuing special experimental work at Chelmsford.

J. J. Leary, superintending engineer in charge of the Chilian contract for two large and three small Marconi stations, sails for Chili, with the balance of the staff to be engaged on this work, on October 31st.

E. S. D. Marden, from the London office, has been temporarily attached to Poldhu Station.

H. Nicholls, from Poldhu, has been attached to the constructional staff on the Chilian contract as assistant engineer and operator, and sails for Chili on October 31st.

D. Paton, from Broomfield, sails for Chili on November 15th to take up an appointment in the Naval School under the Chilian Government.

R. F. Pitcairn, from Poldhu, transferred to Clifden for further experience of high-power stations.

C. G. Rattray, from sick leave, has returned to duty in the London office.

H. J. Round has returned from special duty at Coltano, Italy, and is now engaged on experimental work at Chelmsford.

H. Sauve is being relieved at Barcelona Marconi station, and will be attached to the constructional staff on the erection of new Marconi stations in Spain.

A. G. Savill has completed the testing of the Rome station, and inspection of "Averoff" and other ship stations in Greece, and has returned to general work in the London office.

C. H. Taylor, deputy chief engineer of Marconi's Wireless Telegraph Company, left for New York on October 5th to take charge of the erection of high-power transoceanic stations being erected by the Parent Company for the American Marconi Company.

## Movements of Operators

S. K. Alston, from the "Asturias" to the "Itassuce."

A. C. Arnold, from the "Karina" to the "Aidan."

W. F. Atkinson, from the "Canadian" to the "Kenuta."

J. E. Auvache, from the "Inkosi" to the "Indrapura."

G. F. Angill, from the London School to the "Minnetonka."

F. Avery, from the London School to the "Plassy."

A. G. Angill, from the London School to the "Majestic."

F. M. Bailey, from the "Worcestershire" to the "Arabic."

J. Bamford, from the "Guarany" to the "Himalaya."

C. H. Banner, from the "Edinburgh Castle" to the "Kinfauns Castle."

R. J. Basson, from the "Minnetonka" to the "Gloucester Castle."

A. S. Beattie, from the "Araguaya" to the "Commonwealth."

A. Bolster, from the "Scandinavian" to the "Montrose."

S. V. Branton, from the "Ionian" to the "Alnwick Castle."

A. C. Brown, from the "Belgic" to the "Canadian"

W. J. Brown, from the "Viking" to the "Oxfordshire."

T. R. Burrows, from the "Carthaginian" to the "Tritonia."

R. W. Burton, from the "Minnewaska" to the "Sumatra."

W. H. Chick, from the "Letitia" to the "Garth Castle."

F. R. Collier, from the "Oronsa" to the "Hildebrand."

K. S. Cowhey, from the "Campania" to the "Empress of Britain."

W. G. Cox, from the "Italia" to the "Marathon."

J. A. Craigie, from the "Orita" to the "Cymric."

C. H. Crosman, from the "Asian" to the "Orita."

G. G. Chapman, from the "Sarnia" to the "Vauban."

J. W. Carleton, from the London School to the "Cameronia."

B. A. Carter, from the London School to the "Ionian."

D. R. Cormack, from the London School to the "Numidian."

D. Donnelly, from the Liverpool School to the "Victorian."

B. Dawson, from the London School to the "Zealandic."

R. O. Ellis, from the "Inkosi" to the "Sicilia."

T. Fagan, from the "Victorian" to the "Asian."

G. K. Fagg, from the "Corsican" to the "Norman."

W. Gale, from the "Saxon" to the "Plassy."

A. Gibson, from the "Nigeria" to the "Huanchaco."

A. D. Hathaway, from the "Pancras" to the "Asian."

W. J. Hicks, from the "Intaba" to the "Hantonia."

T. F. Holden, from the "Empress of Ireland" to the "Carmania."

J. O. Howard, from the "Teutonic" to the "Akabo."

H. P. Hunt, from the "California" to the "Guelph."

H. J. Horwood, from the London School to the "Arcadian."

E. N. Hewitt, from the Liverpool School to the "Devonian."

W. C. Halliday, from the London School to the "Arzila."

## Football

The Marconi Football Club (London) opened the season in good style on Saturday, October 10th, by defeating the Clement Talbot Club by one goal to nil in the first match of the Western Suburban League. The victors enjoyed the advantage of playing at home, and the only goal of the match was scored by Sharpley from a free kick taken by Smith ten minutes before the interval. The second half was very fast, and both goals had narrow escapes; but the defences held out until the final whistle was blown, leaving the Marconi club the winners of a keenly contested and enjoyable game.

Mr. Godfrey C. Isaacs presided at a smoking concert held during the evening to open the football season, and in response to a vote of thanks proposed by Mr. Andrew Gray, he told some amusing stories against himself as a golfer, for which pastime he confessed he had very little time. A splendid musical programme was contributed to by Messrs. H. W. Merriman, A. C. Truman, W. H. Smith, A. J. Clarke, Cecil Marsh, W. S. Purser (with his banjo), Jack Green, and Archie Harvey (with his Japanese fiddle). Mr. H. F. White was at the piano.

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THE MARCONIGRAPH

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# Science and Literature.

THERE is a belief, which is shared to no small extent by the general public, that engineering is not a matter calling for the exercise of any intellectual faculties. That oft-repeated statement recalls the long-standing dispute between the literary man and the scientists, wherein literary extremists refuse to rank the labours of the physicist and mathematician with the poet and novelist. Mr. A. Campbell Swinton claimed in his interesting address to the Röntgen Society some time ago that literary men have the ear of the world, and constitute the best organised and most successful mutual admiration society on record. The prominent position taken by the literary guild, and their often prejudicial influence on public opinion, lies in part, no doubt, in the fact that relatively little labour or application is required to enable a man to appreciate good literature. It is thus easy to understand the fact that university extension lectures, devoted to culture studies, are very much more popular than those dealing with science. Everyone has views on literature, history and sociology, and, with little or no training, can speak and argue on such subjects with absolute self-confidence.

Not so with the exact sciences, however. Each man's opinion is, in his own view, as good as another, and statistics can always be found which, in their unanalysed state, appear to support the most contradictory of views. The effective force in moulding humanity has been the scientific imagination. As Mr. Campbell Swinton pointed out, no historical character has affected the destinies of the race to more than an infinitesimal extent when his influence is compared with that of the unnamed savage who first had the intelligence to see the uses of fire and the courage to attempt to control it. Some other unknown engineer first saw the possibilities of flint weapons, and once his individual intellect opened the path, the whole tribe of men were able to follow it. Herodotus avowed as a reason for undertaking his history a reluctance to let fade into oblivion the great and admirable deeds of either the Greeks or the Barbarians. Yet, immortal as is the work of the Greek historian, it is a moot point whether it has wielded so potent an influence upon the destinies of the race as the imperishable work of Mr. Marconi seems destined to do. The underrating of intellect in its practical applications is in some measure due to the defective state of secondary education in this country, the trend of which has for too long been in the direction of the "humanities" and away from science. Such work as that of Mr. Marconi represents the triumph of patient and intelligent perseverance over great inherent difficulties, and thus commands an appreciation of the meaning of such work upon human progress.

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M. J DAL PIAZ

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# M. J. dal Piaz

## Director of the Compagnie Française Maritime et Coloniale de Télégraphie Sans Fil

THE career of a man who has made some definite mark in his own particular centre of activity is a subject of more than average interest to the public. And for this reason: there are so many ways of attaining success (all of them slippery and difficult), there are, too, so many varieties or combinations of natural faculty, that the story of how success was attained in every individual case must always fascinate. Malvolio (and incidentally Shakespeare) divided Life's prize-winners, roughly, into three groups. "... *Some are born great, some achieve greatness, others have greatness thrust upon them.*" The feather-pated steward of the fair Olivia was only concerned with the last-mentioned group. We are more interested in the others; and that the definition is obviously correct cannot be gainsaid. No two writers, for instance, have ever attained popularity by the same means or gifts. Pope declared he "wrote in numbers, for the numbers came," while Horace tells us he required years of study and patient toil, and evolved an elaborate system of weeding out his material and polishing his sentences before he achieved success as a man of letters. The same practices are to be observed in business careers. One man is born with a marvellous business capacity, is equipped from the outset of his career with the means necessary for making his way along the appointed road, and is only required to add certain personal qualifications, such as self-discipline, concentration of purpose, and a trained judgment, to assure his progress on the path "that leads to sovereign power."

Another—and this, fortunately for commerce, is no rare type—is he who makes his way step by step up the difficult ladder of business enterprise, reaping as he goes a rich harvest of experience, which ripens into expert knowledge, and finally attains an unassailable position in his sphere of work and the esteem of his fellow-workers.

To this group belongs M. J. dal Piaz, the brilliant director of La Compagnie Générale Transatlantique and of the Compagnie Française Maritime et Coloniale de Télégraphie Sans Fil. He was born in Paris in 1865, and went through the ordinary curriculum of French education, serving his schoolboy apprenticeship in *l'externat*, and later taking up the greater responsibilities of *le lycée*. Not content with merely completing the usual educational course, M. dal Piaz applied himself to the study of the law, and to such good purpose that he early qualified as a solicitor, or, as French legal phraseology has it, *était licencié en droit*. Shortly afterwards—in 1888—he entered the service of the Compagnie Générale Transatlantique, and from this time forward he has been identified with the ever-increasing scope of this important organisation. He has a complete understanding of every branch in the important organisation over which he presides, and, furthermore, has the affairs of every department in the business at his finger-tips; for at different periods of his connection with the company he has filled all its more important posts, with the result that he is now the master-key of this complex machine. Such, in a few words, is the personality of the man who is head of this important company, and among those who control the Marconi interests in France and the French possessions. M. dal Piaz is besides a member of the Upper Council on Navigation, a director and member of the acting committee for La Société des Chantiers et Ateliers de St. Nazaire, and a director of La Compagnie Française Maritime et Coloniale de Télégraphie Sans Fil.

His countrymen have recognised his indefatigable zeal and his services to the State by appointing him an officer of the Legion of Honour.

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# The Production of Electrical Oscillations by Spark-Gaps Immersed in Running Liquids

By W. H. Eccles, D.Sc., and A. J. Makower, M.A.*

IN the sending apparatus for wireless telegraphy the spark is an important feature. The spark usually takes place in air, and when a large amount of energy is to be transformed, special means have to be adopted to prevent the spark from degenerating into an arc between the electrodes. One mode of preventing the formation of an arc consists in moving the electrodes at such a high speed that a spark can only bridge the gap between them during the very brief period when they are in close proximity. The rapid separation

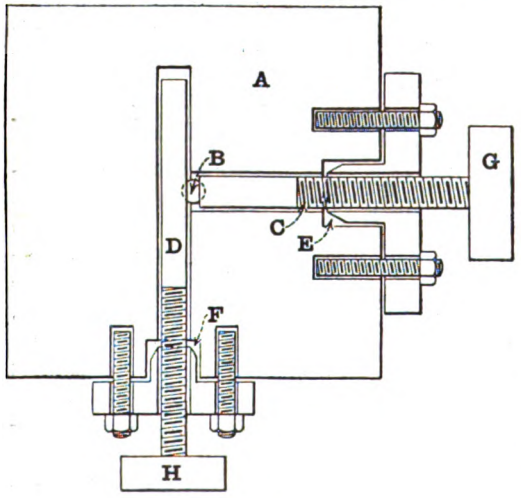


*Fig. 1*

of the electrodes from each other effectually prevents the formation of an arc.

It occurred to us that another method of achieving the required result might be arrived at by causing the spark to be formed between stationary electrodes immersed in a rapidly flowing stream of liquid. With this end in view we have experimented with various liquids and various forms of spark-gaps, and from the facts set out below it will be seen that very good results are attainable by these means. Not only can very efficient extinction be produced with sparks of considerable energy in simple apparatus of small dimensions, but also the enclosing of the spark has the effect of eliminating practically all the noise which accompanies the discharges across the customary open spark-gaps.

The first apparatus tried consisted of an ebonite tube, through the walls of which the two electrodes were passed. The electrodes were brass or iron screws projecting into the tube from opposite sides with their axes in line. The ends of the screws thus confronted each other, the gap between being adjustable. The tube was made out of an ebonite rod about 4 in. long by drilling axially a $\frac{1}{4}$-in. hole, and it was mounted vertically so that water from the mains could be led into it at the top and be allowed to fall out at the bottom end of the tube. The spark-gap was connected in the position usually occupied by an air-spark in wireless telegraph apparatus. It was found after using a variety of transformers and transformer ratios that for large or small gaps, within the range allowed by the bore of the tube, much lower voltages were required to produce the spark in water than were required for an equal length of spark in air. In fact, every attempt to use the high voltages usually applied to air-sparks failed. Thus the most appropriate type of transformer was not the induction coil, but rather one of the ordinary power type. Perhaps the best results obtained with the transformers at our disposal were those in which a Swinburne transformer was used. This transformer was of the hedgehog type with open magnetic circuit which supplied about 1,000 volts at the gap at a frequency of 50 cycles a second. The results obtained with this apparatus were very encouraging as regards the constancy and intensity of the oscillations generated, but not as regards the efficiency of transformation ; it appeared that much energy was dissipated in ohmic losses and in electrolysis in the water.

In order to gauge the performance of the apparatus under something like practical conditions, a secondary capacity-inductance circuit was coupled to the primary oscillating circuit energised by the spark. A number of damping curves were taken with various degrees of

* Read before the British Association Meeting at Dundee, 1912.

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coupling with a view to finding an optimum coupling. Three of these are given in Figs. 2, 3, and 4, which relate to couplings of 25, 23, and 20 per cent. respectively, the other circumstances being unchanged. In these figures the

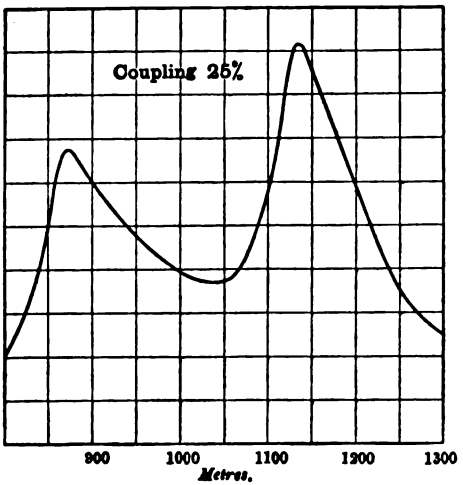


*Fig. 2*

abscissæ are wave-lengths, and the ordinates are effective currents in arbitrary units.

The primary circuit contained a capacity of 4,550 cm. and an inductance of 53,700 cm. as a shunt to the water-spark, and the secondary contained a capacity of 1,380 cm. and an inductance of 188,000 cm. The tertiary circuit comprised a fixed inductance, a variable capacity and a thermo-ammeter, and was, of course, very loosely coupled to the secondary circuit. In Fig. 2 the coupling between primary and secondary was 25 per cent., and the decrement of the higher frequency component was 0·4 per whole period, and that of the lower frequency component 0·09.

There are certain obvious advantages in an oscillatory circuit that produces oscillations of a single frequency under conditions of close coupling. The curves show that a coupling of 23 per cent. was best from this point of view.

As an example of the effects that can be obtained with a very close coupling we give Fig. 5. Here the coupling was estimated at 63 per cent. For this case the primary circuit contained a capacity of 2,640 cm., and an inductance of 73,200 cm., and the secondary circuit a capacity of 1,120 cm. and an inductance of 171,000 cm.

After this an attempt was made to decide whether the efficiency would be increased by maintaining a considerable pressure in the water in the tube instead of allowing it to escape freely at atmospheric pressure; but the type of tube used up to the present proved to be too fragile, and we were compelled to adopt a stronger design. Several dischargers were made, and it was found that ebonite was unsuitable owing to the fact that it was liable to soften through the heating obtained in continuous runs, and glass was liable to crack if the discharge was not regulated with great care. Finally, marble was employed, but experience showed that unless ample thicknesses of this material were used, the pressures produced in the interior of the discharger during the passage of the sparks were sufficient to burst it. The most satisfactory design reached by us consisted of a cube of marble with a side of about 4 in. provided with a vertical channel of $\frac{1}{4}$-in. bore through which the liquids could be caused to flow, entering at the bottom and flowing away at the top so as to sweep away all the gases formed by the passage of the discharge through the liquid. The electrodes consisted of two horizontal metal rods with axes at right angles forming a spark-gap in the middle of the liquid column. This arrangement of the electrodes was adopted to ensure that the discharge should take place inside and not outside the liquid column. By making the section of the electrodes slightly larger than that of the liquid column it was made certain that the discharge should take place only between the end of one electrode and the side of the other. In order to prevent the liquid being forced out by the high pressures developed it was found necessary to provide

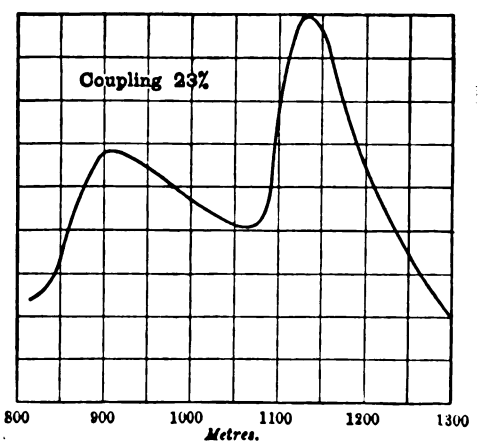


*Fig. 3*

stuffing boxes at the points where the electrodes entered the marble.

Fig. 1 is a horizontal section of the discharger through the plane of the electrodes, and shows the marble cube, A, with the liquid column,

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B, in the centre, and the electrodes, C and D, entering at right angles through the stuffing boxes, E and F, and provided with ebonite handles, G and H, for adjusting the gap. The length of the gap was adjusted by rotating the handle, G, and when the side of the electrode, D, became pitted a new surface could be brought into action by rotating the handle, H.

The first experiments were made with water, and it was found that with a given voltage and length of gap there was a rate of flow of the water that gave the best oscillation in a capacity-inductance circuit connected across the gap. If the water flowed too quickly no sparking took place, and if the water flowed too slowly arcing was produced instead of sparking. Even with the flow adjusted so as to give the best possible results it was found that much energy was wasted owing to the losses arising from the conductivity of the water between the electrodes; this makes the water-gap less efficient than an air-gap; in fact, on the whole there was no improvement exhibited by the apparatus designed for high-water pressures over the old apparatus, in which the water was allowed to escape directly into the atmosphere. On this account we were led to make fresh trials, using transformer oil instead of water. This change made the apparatus more efficient; in fact, the efficiencies attained were about the same as those attainable with the discharge in air between

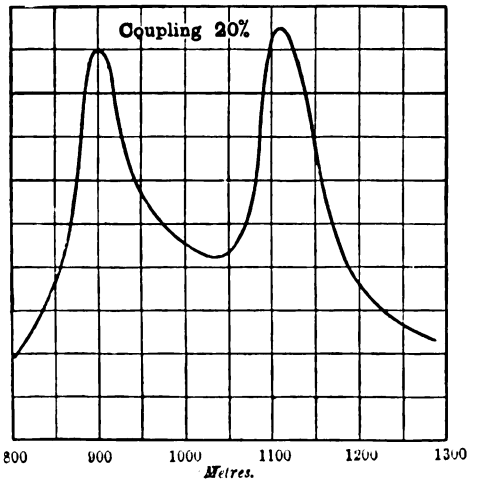


*Fig. 4*

metal balls. The discharge enclosed as above described is remarkably silent and remains steady for protracted periods, so that it is useful for laboratory experiments.

Experiments made with oil in a discharger with glass sides showed that vapour is freely formed as soon as the discharge passes, and that unless the oil is caused to flow quickly the vapour displaces the liquid from the space between the electrodes and arcing ensues.

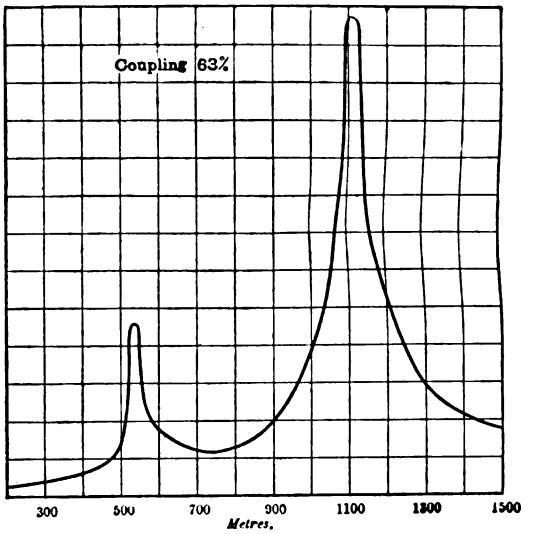


*Fig. 5*

The oil in all our experiments was contained in a small tank, and forced round the circuit by means of a pump. Although the same oil could be used for several days it ultimately became too conductive by getting loaded with finely divided particles of carbon, and then it required filtering before further use.

The above experiments having indicated a satisfactory working of the form of discharger shown in Fig. 1, a number of tests were made, using it in conjunction with a standard wireless telegraph outfit of Marconi's Wireless Telegraph Company. Owing to the fact that we intended to carry out tests with couplings ranging up to values far in excess of those attainable with this apparatus, the secondary of the high-frequency transformer was replaced by a flat coil, which enabled very tight couplings to be reached.

It was soon found that when the oil-spark was used, with almost any degree of coupling, some impulse excitation was taking place. For example, when the coupling was 12 per cent. a single wave-length of 620 metres was observed in the primary and secondary circuits, and no other wave-length was detected; whereas when the spark occurred in air the same circumstances gave two distinct wave-lengths of 570 and 640 metres. On another occasion, with slightly different circuits and

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with a coupling exceeding 60 per cent., the air-spark gave two wave-lengths again, namely, 170 and 680 metres, while the oil-spark gave a main wave-length of 640 metres with two subsidiary waves of 157 and 670 metres, 640 metres being the measured wave-length of each of the circuits taken separately. The predominance of the natural frequency in this case showed that very good shock-excitation was attained with the discharge in oil.

Turning now to the question of the efficiency of the apparatus when using sparks in flowing liquids, it was found easiest to make measurements of the input from the alternator and of the current produced in the aerial, both for sparks in liquids and for sparks between metal balls in air. A comparison of the results gives a fair notion of the relative efficiencies of the methods.

**Factors of Efficiency.**

The first point to notice is that the efficiency depends very greatly on the rate of flow of the liquid and on the voltage applied to the gap, but not very greatly on the length of the gap. As a general rule the efficiency is best when the voltage used on a given gap is taken as low as possible for regular sparking. As regards alterations in the rate of flow of liquid the effect is more striking with water than with oil. With water the efficiency rises greatly as the rate of flow is decreased, the lower limit of speed being determined by the overheating of the electrodes.

With water flowing slowly an aerial current of 9·2 amperes was obtained with an input of 525 watts; while an air-spark gave with the same apparatus an aerial current of 5·5 amperes with an input of 450 watts, the efficiencies being in these cases in the ratio of 3 to 2. This high efficiency obtained here with water could, however, not be maintained without constant feeding of the electrodes.

With oil it was easy to maintain the gap working so as to give 4·6 amperes in the aerial with an input of 375 watts, which works out to exactly the same efficiency as was obtained above with the same apparatus with an air-spark.

The principal fruit of our experience with these dischargers is that, as regards water, a very convenient, simple and noiseless oscillation generator can be made which gives steady oscillations for long periods if the flow of water is rapid enough to keep the electrodes cool, but the efficiency under these circumstances is low. As regards oil, its use presents the advantage of giving better quenching than the air-spark and of eliminating the deafening noise associated with the latter, while the efficiencies of the two forms of apparatus are the same.

**Discussion.**

Captain H. Riall Sankey asked for information regarding the power used in the experiments described in the paper and the effect of the inflammable gas when working with 50-kw. or less in the spark. Prof. G. W. O. Howe wanted to know if the same oil was used many times and whether it carbonised. He thought it would be interesting to know how the very modest figures of efficiency were obtained. Prof. J. T. Morris asked Dr. Eccles if he had tried any other liquid than that described. He, Prof. Morris, had made some simple experiments with both oil and amyl-acetate, and had found that the latter obviated the difficulties of carbonisation which were encountered with oil; moreover, there was no risk of explosion with this and it also seemed to give a sharper "kick" in the signals. It is necessary to explain that Dr. Morris conducted his experiments on a very small apparatus.

Dr. Eccles, in reply to the discussion, said the power used in the experiments was only 5 kw., but there was no danger from the inflammable gas, as precautions were taken to prevent any accumulation. There seemed to be no deterioration of the oil, although, after a while, it got rather thick through carbonisation, and it could then be filtered. What carbon was formed on the electrodes the jet of oil removed very rapidly, this jet working at something like 4 ft. per second. The figures of efficiency were not absolute measurements, but merely comparative with the spark gap. The absolute efficiency was not known. He agreed that the use of amyl-acetate would give better results than oil, but it was very expensive.

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## Wireless from the Sun

In a certain sense every shining star in the heavens is constantly sending out spherical electro-magnetic waves within the range of visual perception, besides probably many longer waves outside of that range. In this particular sense we are constantly receiving wireless telegraph waves from every visible orb, and the message received is not news but light. Moreover, since all animal energy is derived from plants, and all plants build up their substance from the energy contained in the sunlight they receive, it follows that all our muscular energy is derived indirectly from wireless telegraphy waves received from the sun.—*Dr. A. E. Kennelly.*

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# Automatic High-Speed Working

## A Notable Wireless Development

"MARVELLOUS, isn't it? There's nothing we shan't be able to do in ten years."

When a character in one of Mr. Rudyard Kipling's stories ventured forth this opinion and prophecy concerning wireless telegraphy, there were probably few of the author's vast public who realised that the prediction was so near fulfilment.

"How I want to live and see it develop." It is less than ten years since these words were written, and within that time there have been developments before which even the most optimistic prophecies pale. This is not the moment to make a survey of the marvellous development in the wireless world; what we propose to do is simply to refer to one which is the necessary outcome of the progress referred to.

The great acceleration in the speed of wireless working over long distances has exceeded the power of human agency to receive and transcribe messages in the ordinary way, and there is a demand for some reliable and efficient means of automatic reception. The question of automatic transmission and reception has been carefully thought out by Mr. Marconi and his assistants, and as a result of prolonged investigations and experiment, means have been found which furnish a satisfactory solution thereto. It is proposed to use the system in the Imperial scheme, which is now under the consideration of the Select Committee of the House of Commons, and in order to satisfy the authorities that the apparatus has now reached a stage of perfection, a demonstration of high-speed automatic transmission was recently given at the Marconi Works at Chelmsford to representatives of the British Post Office, the Admiralty, the War Office, Colonial Office, and the Crown Agents for the Colonies. The speed signals were transmitted from Poldhu, Cornwall, where other representatives of the Government were present, and these were received and recorded at Chelmsford both by means of a recorder on the principle of a gramophone, and printed on tape. It was demonstrated that by this means signals could be received at a high rate of speed on a recording cylinder—the cylinder being afterwards caused to repeat the messages at a rate of speed sufficiently slow to enable the operators to read them; while by the other method a printed tape left the receiver, recording the messages as they were received.

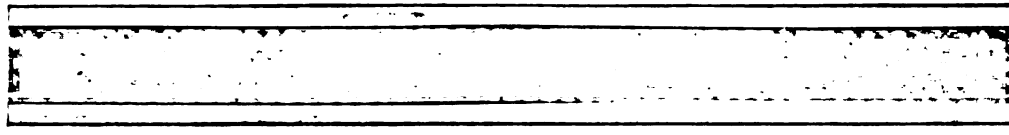

*Fig. 1.—Photographic Tape. Signals given by Deflections*

Transmitting was done at Poldhu with the new synchronous disc discharger, which was worked from the Wheatstone automatic transmitter through a special relay. No troubles were found in working the transmitter at speeds of over 50 words per minute. At Chelmsford, where a single wire aerial was used for receiving, the maximum signals were very strong on ordinary wireless receivers, but for the purpose of the demonstration they were reduced to medium signals.

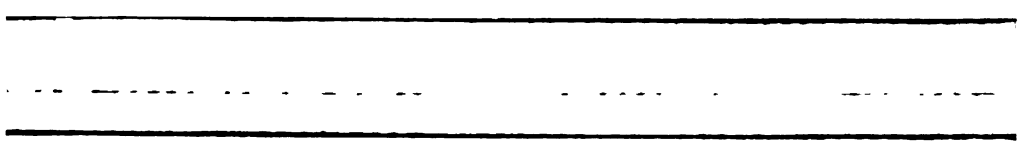

*Fig. 2.—Photographic Tape. Ordinary Morse Signals*

The photographic reproducing apparatus, which the Government representatives care-

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fully inspected, consists of a string galvanometer, and an optional arrangement for projecting the shadow of the string on to a narrow slit behind which sensitised paper is passed at a speed which is determined by the rate of working required. The effect of the signals on the galvanometer is to move the string, and throw a shadow more or less to one side while the signals are actually coming through. A white line is produced on the dark ground of the sensitised paper, and the deflection of this line shows the signals. An example of this type of tape is shown in Fig. 1. Another type of tape was obtained by screening the slit from all light, with the exception of the place normally occupied by the shadow of the string. The effect of the signals is to move this shadow and allow a small point of light to fall on the sensitised paper, which brings out the Morse signals as black dots and dashes on a white ground—an example of which is shown in Fig. 2. The string galvanometer can be operated direct from the receiving circuits, but it is preferable to operate the galvanometer through a special relay, which gives steadier signals and a better speed. On emerging from the slit the sensitised paper passes through a series of developing, fixing, and washing baths, and is delivered outside the machine one minute after being exposed, when working at a speed of 50 words per minute. The sensitised paper is put in the machine on spools of 1,000 feet each, which is sufficient for 5,000 words. At the demonstration perfect signals were shown with both kinds of tape at a speed of 55 words per minute.

Another method of recording signals received, which was inspected by the Government representatives, was based upon the gramophone principle. For recording by this method the signals are magnified and caused to act on a loud-speaking telephone. The effect of this is that signals which are only of medium strength on the usual wireless circuits are heard with ease on the special telephone at a distance of 50 feet away, and on the occasion of the demonstration the signals were heard by everybody in the room. The signals were recorded on a cylinder at the rate of 55 words per minute. When the cylinder is full, all that is necessary is to place it on another machine, which can be set to run at a slower speed, so that the signals can be read with ease. This method of recording has many advantages, chief amongst which may be mentioned that of retaining the natural distinction between the note of the signals and the sound of the atmospherics. When the cylinder is run slow so as to enable the signals to be read easily, the note is naturally lowered in proportion, but the tone of the atmospherics is also lowered, and the difference between them is therefore maintained.

## News from Spain

AT the central observatory of the Meteorological Office of Madrid there has been installed a wireless station. Apparatus has been furnished by the Compañia Nacional de Telegrafia Sin Hilos, and by this means the observatory will be able to receive daily reports of atmospheric and weather conditions in different parts of the world. The value of wireless telegraphy to meteorological research is becoming more generally recognised, and the Spanish authorities are to be congratulated upon having installed a wireless equipment at their central observatory.

* * *

The Ministry of the Interior have decided upon a praiseworthy step in their decision to establish a school for the training of wireless operators. We understand that the school will be one of the most complete of its kind in existence, and therefore it should be in a position to satisfy what is becoming a pressing want, not merely in Spain, but in all countries possessing a maritime fleet. The school will be equipped with a 1½-k.w. Marconi set and emergency gear, whilst there will also be installed a short range set and several practice buzzers, the latter being of the type which has already been described in THE MARCONIGRAPH, and which has proved to be an invaluable instrument for practice in receiving signals. The Compañia Nacional have already a fine school in Madrid, which is well filled with learners, and which is doing very useful work. This school will form the basis of an article which we hope to publish in an early issue, intended to illustrate the decidedly practical steps which the Marconi companies have taken to train suitable candidates to become efficient operators.

## Coming Events

FRIDAY, DECEMBER 6TH.

*Wolverhampton & District Engineering Society.*—Dr. J. D. Coales on "Wireless Telegraphy" at the Technical School, Wolverhampton.

MONDAY, DECEMBER 9TH.

*Institution of Post Office Electrical Engineers.*—Meeting at the Institution of Electrical Engineers, Victoria Embankment, London, W.C., 6 p.m.

TUESDAY, DECEMBER 17TH.

*Physical Society.*—Annual Exhibition of Scientific Instruments at Royal College of Science, South Kensington.

THURSDAY, DECEMBER 19TH.

*Institution of Electrical Engineers.*—Ordinary General Meeting, Victoria Embankment, 8 p.m.

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# Further Details of the New Compass

IN the September number of this magazine we described a new wireless compass which is admittedly an important advance in the provision of means for enabling ships at sea to locate their position in foggy weather. It is not only when a ship is near land that its proximity becomes a matter of urgency; the necessity of ascertaining the direction of an approaching or overtaking ship is equally urgent. A further extended series of trials has made it evident that the wireless compass developed at the Marconi works will make it possible for a vessel to navigate the whole coast of a country during a fog, and to take bearings without recourse to any visible method.

If, in a fog, a ship is able to determine the

*Fig. 1.—The Wireless Compass on the s.s. "Onward".*

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positions of known ports or places with a fair degree of accuracy, it can readily deduce its own position by simple calculation. This is

*Fig. 2.—Radiogoniometer*

exactly what becomes possible by means of the wireless compass. Its application has been simplified in a high degree by the invention of the radiogoniometer, a compact regulating instrument, by the adjustment of which an operator can discover the direction of the oscillations.

There are, of course, various devices for determining with more or less exactness the situation of a radiotelegraphic station from which signals are being received. Many of the aerials or antennæ now in use have a certain amount of directional effect, and it is easy so to dispose them as to render the effect still more marked. But some disadvantages are involved. In the ordinary way, for instance, a ship at sea is usually anxious to pick up messages from all ships within its possible radius of interception, but if the receiving apparatus be directional, it can intercept signals only from ships lying within a specific area. Any directional arrangement of aerials should therefore be adjustable, so as to bring within focus, so to speak, the various sections of the horizon one after the other. The drawback to many schemes for accomplishing this object is that the arrangement required is unwieldy and complicated: the advantage of the Marconi system is that two special forms of triangular aerials are fixed permanently, and the moving part responsible for the "searching" is quite small and readily handled.

Some idea of the apparatus can be obtained from the accompanying illustrations. From the outside of the roof of the "wireless" room on the topmost deck runs a system of triangular wire stay aerials. This, as shown in Fig. 1, may be suspended between the two masts, or it may be fixed to one mast, in which case a special bracket is provided for its support. There are two complete triangles at right angles to each other, and each is fitted with two wires leading from the bases of the triangles into a small wooden box, Fig. 2, inside the "wireless" room. In this box is fitted a small hollow cylinder of vulcanite wound up and down with rows of naked copper wire, each row about a sixth of an inch apart. Outside this movable cylinder, at a distance of an eighth of an inch away, are four sets of about forty insulated wires attached to the four wires coming down from the two triangles outside. The hollow cylinder turns by the means of a hand-screw on a compass dial above. When signals are being received, instead of the message coming from "somewhere" as hitherto, the ship can now up to forty miles' distance tell from which direction the signals are coming, for as soon as the operator hears the signals, he turns the handle to the right until he reaches a position beyond which it is not possible to receive signals. When he has reached that position he turns

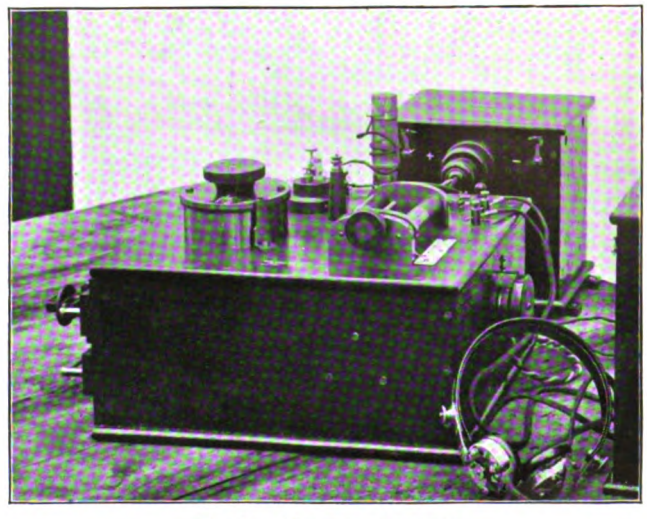

*Fig. 3.—Receiving Apparatus*

the handle in the opposite direction, and finds a corresponding position on the left; the mean between the two points at which the signals

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become inaudible is the direction of the sending station.

As to the possible uses of this new invention, two examples suggest themselves. A liner or a cargo ship may be broken down in mid-ocean and drifting, and because for two or three days it has not been possible to obtain a sight of sun, moon, or stars owing to mists, fogs, or cloudy weather, the captain does not know exactly where he is, and he cannot tell his would-be rescuer exactly in which direction he is to steam, for though dead reckoning is good enough for ordinary purposes on straight courses when everything is in order, after having drifted even for a few hours exact accuracy as to position becomes impossible, especially if there be wind and current, both of them variable in strength and direction. But now comes along a vessel fitted with the Marconi compass, and because she can find out where the other ship is in relation to herself she can race to her rescue so long as the vessel in distress can send signals.

Yet another instance. One of the most dangerous operations in navigation is when approaching a rocky coast in a fog, or when approaching unlighted promontories after a day or two of dead reckoning. Though the propellers have turned so many thousand revolutions, and though the captain knows that at such a speed and in such a time his ship should be in such a position, it is largely a matter of luck and guesswork. The result is that when he approaches the shore under such conditions he usually does so in a hesitating manner. First he goes half-speed, then dead slow, then he must stop and use the lead. Perhaps he gets a hundred fathoms, and he goes on again for half an hour, only to stop and find forty-five fathoms and a sandy bottom. Where is he? There are dozens of places on the chart, some quite close to shore, which answer this description, whether he be near Daunt's Rock or Fishguard or the Land's End or the Needles. Then comes in the compass. If the lightship or the shore station is fitted with wireless telegraphy the captain can tell whether he is in his right course or not. Crookhaven may be N.N.E., or the Lizard due west, or whatever may be the compass bearing, and thus fog notwithstanding and despite snow, mist and blinding rain-storms, but always barring risks of other traffic, the vessel can go full speed ahead.

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The report of the governors of the Leith Nautical College refers to the importance of teaching wireless telegraphy at the college, and adds that the governors will keep the matter carefully before them.

## The "Matatua's" Record

A 1½-kw. Marconi standard ship set and emergency gear has been installed on the s.s. "Matatua," belonging to Messrs. Shaw, Saville & Albion, Ltd. This vessel has recently returned from a long and interesting cruise, throughout which the wireless installation gave excellent results. She proceeded from London via the Tyne and North of Scotland to Montreal; thence via South Africa, direct to Melbourne, Sydney, and New Zealand ports. The return journey was made via the Suez Canal to Dunkirk, Liverpool, and London. The voyage lasted just 26 weeks, and one of the most interesting vessels passed was the ex-convict ship "Success," whose own adventurous journey across the Atlantic was described in the September MARCONIGRAPH by the operator in charge of the Marconi station on that vessel. The "Matatua" communicated with the "Success" for several hours at a distance of 170 miles, the signals of the latter vessel being very good. The "Matatua" also obtained excellent results with the stations at Swakopmund and Luderetzbucht in South-West Africa, both being in touch for a week, and opening communications at over 1,000 miles at night. She also communicated with these stations when at a distance of 398 miles, communication taking place at mid-day in full sunshine. The success of these communications led to the operator at Swakopmund remarking to his colleagues on the "Matatua": "You have a big station, which is clear and strong at over 1,000 miles." This incident furnishes a further demonstration of the extreme efficiency of the Marconi standard ship sets.

Durban and Capetown stations gave equally good results. It is of special interest to note that during the run in the southern ocean from July 16th to August 4th, where the "Matatua" made down to 47.00 s., on the way to Melbourne, communication was maintained and positions exchanged daily with the "Anchises" of the Blue Funnel Line, when the former vessel was at times over 600 miles south of the latter. The "Demosthenes" was also within range several days up to a distance of 800 miles, and communication was also established with the sister ship "Miltiades" at a distance north of 1,000 miles, bound for Durban. Thanks to the efficiency of the wireless apparatus the "Matatua" was never for any appreciable length of time out of touch with the world's affairs. On October 10th strong signals were received from the Antipodes at 2,700 miles. Communication was opened with Niton Station from near Malta, the coast station responding to a general call made from the ship on October 29th, and easy communication was made between the two at 900 miles on several occasions prior to passing Gibraltar.

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# The New Works of the French Marconi Company

A SHORT time ago the French Chamber of Deputies passed a Bill requiring that all material required for the installation of wireless apparatus on board French vessels was to be manufactured in France, and the immediate result of this Act was to make the existing workshops of the French Marconi Company—the Compagnie Française Maritime et Coloniale de Té égraphie sans Fil—entirely inadequate to the demands placed upon it.

*Machine Shop.*

For some time past the increasing output of material had made it evident that, sooner or later, new premises would have to be sought for or built, and the Company had already taken steps to alleviate the rush of work by the occupation of a larger factory and by increasing the staff when the demands of the Government made the necessity not only imperative, but urgent.

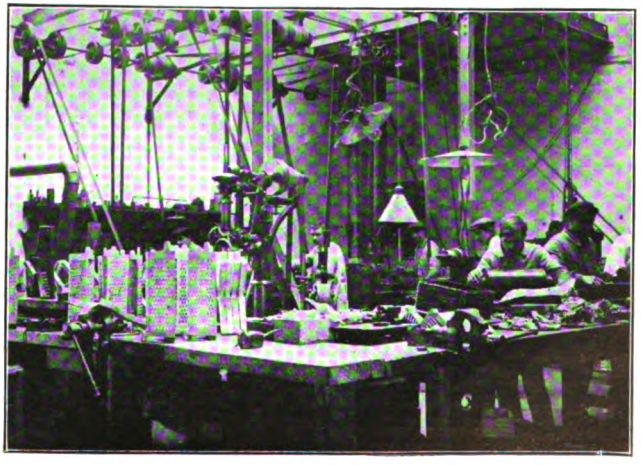
The new workshops are situated in the Rue Farcot at Saint Ouen, only a few minutes outside Paris, and are quite easy of access owing to the numerous tramway services which traverse this neighbourhood, so that for all purposes of business it is as conveniently situated as if it stood in the heart of the French metropolis.

The workshops comprise a vast machinery room, 60 ft. long, 50 ft. wide, and 25 ft. high. There is besides a special room, measuring 15 ft. by 20 ft., which is reserved for the manufacture of induction coils; and attached to this is a testing room, where every instrument, even the most insignificant, which has been manufactured by the Marconi Company is weighed in the balances, nor passed out thence until it has been found perfect, down to the very smallest particular. Here have been installed two transformers, one of 2 k.w., the other of ½ k.w., 150 periods, 100 volts, as well as a battery for charging accumulators. Here also are tested stations of various sizes, and all the special Marconi apparatus. A room is reserved for testing transmission condensers, and measuring the capacity of oil condensers and Leyden jars by means of the cymometer.

The motive power for the machines is supplied by the Great Central of Saint Denis, which has an alternating current of 110 or 220 volts, but which, by means of a transformer, can be raised to a maximum of 2,000 volts.

Last of all, adjoining the workshops, is a yard of about 1,200 sq. ft., which is surrounded with numerous sheds erected for the purpose of storing material.

The French Marconi Company are to be congratulated upon their possession of such an up-to-date and spacious factory, but we have a shrewd suspicion that they will not long be content with even these large workshops, for their constantly increasing business tends to the belief that before long the *ateliers* in the Rue Farcot will require to be enlarged to meet the necessary demands.



*Mounting Shop.*

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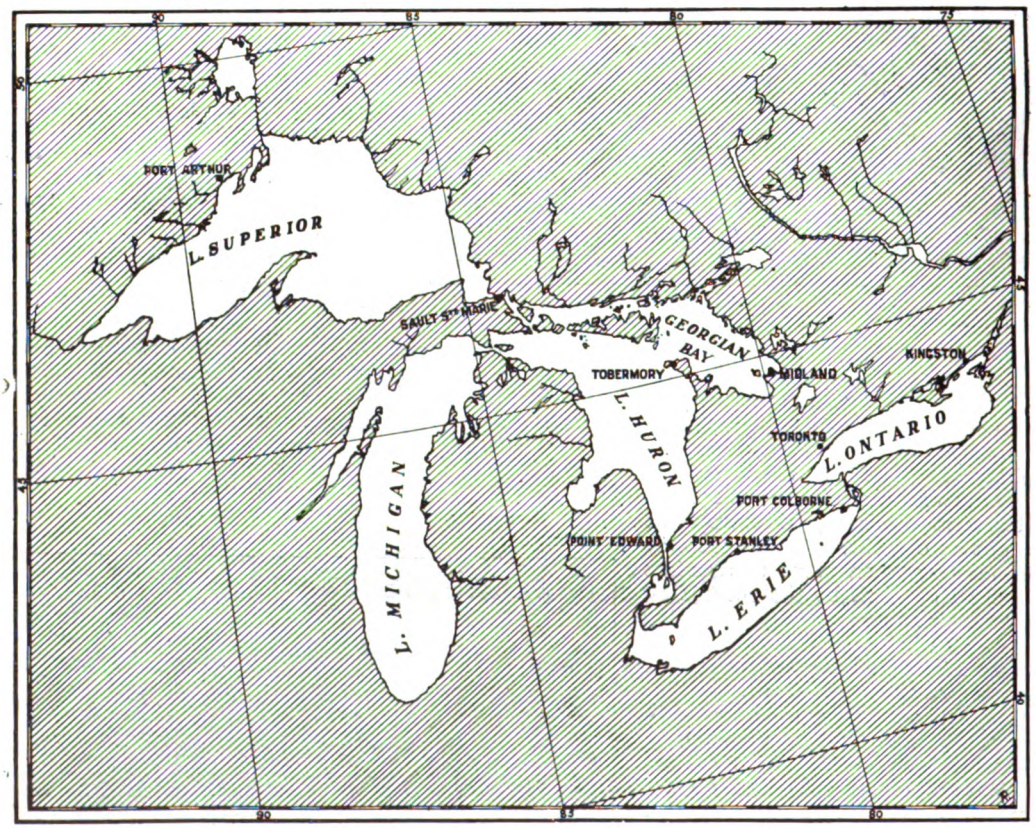
# Wireless Stations on the Canadian Lakes

IN the early days of November the following announcement appeared in the Press :

Marconi's Wireless Telegraph Co., Ltd., is advised that the contract with the Canadian Government for the operation and maintenance of nine additional stations on the Great Lakes of Canada has been signed. When these stations are completed the Canadian Company will receive an additional subsidy from the Canadian Government of $31,500 per annum. The Agreement is for a period of nineteen years.

Following upon the important contract with the Canadian Government, which we were able to announce in these columns some months ago, the above possesses a special significance. It was made a few days before the announcement of the approval by the Norwegian Government of the contract entered into between the Marconi Company and the Norwegian Director-General of Telegraphs for the erection of a high-power station in Norway to link up the latter country with the United States of America, and it should help the public to obtain a clear perception of the true state of affairs in the wireless world.




*Wireless Stations erected and to be erected by the Marconi Co. on the Great Lakes for the Canadian Government*

Canada has for long been alive to the full significance of wireless communications, and her attitude has been consistent with what might be expected from a country whose remarkable development is likely to con-

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stitute one of the most striking historical facts connected with the economic progress of the present century. At the time when Mr. Marconi was making notable experiments in Transatlantic wireless telegraphy the Canadian Government came to the assistance of the company with a subsidy of $80,000 towards the equipment of a high-power station at Glace Bay. The Government of to-day are no less zealous than were their predecessors for the maintenance of wireless communications by the most reliable and efficient system available.

The Company has completed the erection of three stations for the Canadian Government at Midland, Tobermory and Sault Ste. Marie. These stations will work in conjunction with the station at Port Arthur, erected in December, 1910, by the Marconi Company, and now to be taken over by the Dominion Government. A station at Sarnia is now in course of construction, and other stations are to be built at Port Stanley, Port Colborne, Toronto and Kingston, which will also work in connection with the existing stations.

*Marconi Station at Sault Ste. Marie.*

The erection of these stations on the Great Lakes is a continuation of the system of wireless telegraph stations in connection with the great waterways of Canada which was commenced in 1904 in the Straits of Belle Isle and at Cape Race, Newfoundland, and has been completed as far as Montreal. The Great Lakes branch when completed will also connect with Montreal.

The main uses for which this system of stations is intended are :

1. To aid navigation by enabling the masters of steamers to communicate with the shore, their owners, or agents, and the ports which they have left, or to which they are destined.

2. To provide similar facilities for passengers.

3. To provide direct communication between the points where shipping interests are centred without necessitating the use of the more circuitous routes of the land-line telegraph for communication between these points.

The points that have been chosen on the Great Lakes will show at once how these interests have been considered. By the opening of navigation in 1913 all the main shipping points in the Western Lakes will be in direct communication with one another by wireless ; these points are : Midland and Victoria Harbour, Sarnia, Sault Ste. Marie, and Port Arthur.

The necessity for stations on the Great Lakes might be questioned by those unacquainted with the conditions. Steamers probably find the greatest usefulness in wireless telegraphy when they are in close proximity to shore, leaving it, making a port, entering canals or narrow straits, and under other similar circumstances which occur very frequently with Great Lakes vessels. It must also be remembered that the larger of the Great Lakes are at certain seasons subject to exceedingly stormy weather, fogs, ice and cold, just as much as the oceans, and at such seasons constant communication with land or passing steamers is very acceptable.

The site of each station will cover an area of about 650 ft. by 150 ft. There are erected two wooden masts, 450 ft. apart, each 185 ft. high ; the masts are built in three sections, supported by steel guys, and are 22 ins. in diameter at the bottom and 9 ins. at the top.

Each station is provided with two houses, one double dwelling house containing two dwellings, and one station house separated from the dwelling house by about 50 ft. The

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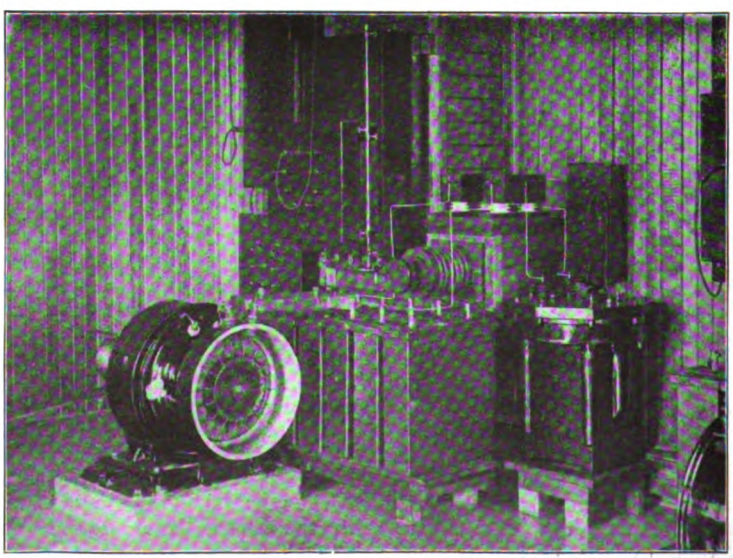
*Receiving Apparatus and Switchboard at Sault Ste. Marie.*

dwelling houses provide accommodation for three men, and have been made very comfortable. The station house is divided into engine and transmitting room, operating room and office. All buildings are of wood with concrete foundations.

A standard type of transmitter is being installed at all the Great Lakes stations; it consists of a 10 h.p. 3 phase 550 volt standard induction motor worked by public power supply. The motor is directly connected through a flexible coupling to a special A.C. generator, generating A.C. at 440 volts and 240 cycles, and a spark discharger is attached to the A.C. generator: this consists of an insulating disc attached to the generator shaft, and rotating inside a muffler. Fixed in the muffler and insulated from it are two fixed electrodes, adjustable radially, and coming opposite to any two adjacent rotating disc studs. These fixed electrodes form the terminals of the sparkgap, and it is between their inner extremities and the points of the rotating studs that the spark occurs each time the latter come into a position exactly opposite the fixed electrodes. The fixed electrodes can also be adjusted in an angular direction. This adjustment allows their position to be fixed so that the spark always occurs in a certain position relative to the A.C. generator pole pieces, and therefore relative to the curve of the E.M.F. of the generator. It is arranged that this point shall be that point in each alternation at which the condenser has been charged to maximum voltage. All these complications in the design are necessary to enable the spark to be obtained absolutely free from arcing, and giving a pure musical note. The vibration per second of the musical note is twice the A.C. generator frequency, in this case equal to 480 per second. The note is about equal to middle C on the piano. The remainder of the transmitter is of regular design, consisting of a transformer for 240 cycle A.C., and specially constructed with regard to transformation ratio and magnetic leakage, various high and low-tension adjusting and protective chokers, and glass plate condenser capable of withstanding a voltage of 50,000 volts, and of a capacity of ·06 M.F. high-frequency primary and secondary inductances and oscillation transformer. The transmitter is capable of emitting oscillations of any wave-



*Transmitting Machinery at Tobermory*

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length between 600 and 1,700 metres, but is specially adjusted for wave-lengths of 600 metres and 1,600 metres, the former being the standard wave-length for ship communication, and the latter being solely for communication with the Great Lakes stations.

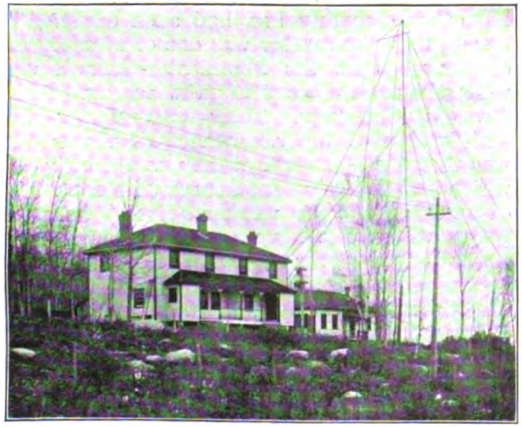
The aerial wires are stretched between the two masts, and are supported by four strain insulators designed for a mechanical load of 1,500 lbs., and to withstand an electrical voltage of 100,000 volts wet or dry.

The transmitting apparatus is completely duplicated at all stations. Where a public power supply is used, one 8 h.p. gas engine set is installed to provide motive power in case of breakdown of the electric power supply. Where no public power supply is used, and the engine is the main motive power, the engine is duplicated with the remainder of the transmitting gear. The only station of this latter type to be erected is at Tobermory.

The receiving apparatus is contained in a room entirely separate from the transmitters, and consists of the Marconi type of valve receiver, with tuning apparatus capable of receiving similar wave-lengths to those transmitted by each station, and also the Marconi magnetic receiver is installed as an emergency or duplicate. The photograph of the receiving room shows the operator's chair with the receiving apparatus on the table; the switchboard completely controls the transmitting apparatus, and can be manipulated by the operator without rising from his chair.

At the Port Arthur station preliminary preparations for converting this station into a standard station have been commenced.

As is well known, different climates offer conditions favourable or adverse to wireless telegraphy, and these conditions influence the design of the station. Present experience shows the climate of the Great Lakes of Canada to be particularly favourable to wireless telegraphy in the winter time, but somewhat adverse to it during the summer. During the summer season electrical disturbances are frequent, and these are always accompanied by disturbances to wireless telegraph receivers. In telephonic reception these disturbances evidence themselves by scratching and dull-tuned noises in the telephone, and it is when these electrical disturbances exist that the pure-toned note of the transmitters installed on the Great Lakes is particularly advantageous.



*Midland Station, showing only one Mast.*

*The S.S. Assiniboia of the C.P.R. Great Lakes Fleet leaving Sault Ste. Marie.*

Now that the land facilities are being provided Canadian steamship owners on the Great Lakes have commenced to equip their vessels with wireless telegraphy. Up to the present eleven Canadian steamers are operating. These are:—Canadian Pacific Railway (Great Lakes) steamships, "Alberta," "Keewatin," "Assiniboia," "Athabasca," "Manitoba," the Northern Navigation Company steamers "Huronic," "Hamonic," and "Saronic," and the Canadian Towing & Wrecking Company vessels: barges "Imperial," "Empire," and "Provence."

It is expected that during the winter of 1912-13 there will be considerable activity in the fitting with wireless telegraphy of Canadian Great Lakes steamers. A large number of these steamers trade with United States ports, and recent United States legislation makes equipment with wireless telegraphy compulsory with all vessels trading in United States ports. This legislation for the Great Lakes comes into effect on April 1st, 1913.

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# The Imperial Wireless Scheme

## Proceedings before the Select Committee

THE Select Committee appointed by the House of Commons to inquire into the contract entered into by the Post Office with Marconi's Wireless Telegraph Company for the erection of a chain of Imperial wireless stations, held its first public meeting on October 29th. The chairman of this Committee is Sir Albert Spicer, and the other members are Mr. James Falconer, Mr. Gordon Harvey, the Hon. Neil Primrose, Sir Herbert Roberts, Mr. Handel Booth, Mr. Leopold Amery, Lord Robert Cecil, K.C., Mr. George Faber, C.B., D.L., Mr. Donald Macmaster, K.C., Mr. Harold Smith, Mr. Henry Terrell, Mr. John Mooney, Mr. William Redmond, and Mr. J. Parker.

The first ten sittings were occupied in receiving evidence from, and examining, four witnesses, seven days being devoted to the examination of Sir Alexander King, the Secretary of the Post Office. Sir Alexander, who opened the case for the contract, gave an outline of the history of the negotiations which led up to the signing of the contract with the Marconi Company. He explained what other courses there were to choose, and why they were rejected, the main reason being that the Marconi Company were the only people who had had the enterprise to undertake long-distance working, and had shown that they could do it. In reply to questions put to him by members of the Committee, he expressed his opinion that the Post Office had made an exceedingly good bargain. Further questions, prompted by the idea that his department had not given sufficient attention to the offer of the Poulsen Syndicate, elicited from Sir Alexander the statement that the Government would have been very much to blame if they had speculated on a system which had not been proved; for if after twelve months the suggested demonstration had failed, they would have been in a worse position to negotiate than before, and if a war had broken out in the meantime they would have had no defence for their action. He emphasised the importance of Britain to be first in the field with wireless. He believed that international regulation of wireless telegraphy would ultimately extend to long-distance stations, and he assumed that property in wireless would be recognised in any regulations made. The first definite suggestion that the Marconi Company should have the contract came, not from the Post Office, but from the Imperial Defence Committee, who based their recommendation upon strategic considerations, and also on the ground that there should be no avoidable delay. The Post Office had not given the Marconi Company the monopoly; the Marconi Company were already in possession, and had themselves created the monopoly because no other company had shown its efficiency for world service in the same degree. Replying to further questions, Sir Alexander King said he believed the German Government had given a contract to the Telefunken Company for the installation of long-distance wireless telegraphy between the Caroline Islands, the Solomons, and Samoa, but in no case was the distance two thousand miles.

Mr. Llewellyn Preece, a civil and electrical engineer, and a partner in the firm of Preece, Cardew & Company, consulting engineers to the Crown Agents for the Colonies, and to the High Commissioners for New Zealand and South Africa, next gave evidence. He said that during the last thirteen years he had been largely responsible for the wireless telegraph work in connection with the Crown Colonies, which had been placed in the hands of his firm. He had carefully studied the agreement between the Postmaster-General and the Marconi Company, and the approved specifications submitted by the company. The Marconi Company was the only one which had had continuous experience of long-distance commercial working, some of their stations having worked over distances exceeding 2,000 miles. No other company had had such experience. Seeing that the matter was one of urgency, he considered that the Postmaster-General was well advised in accepting the tender of the Marconi Company. Their ground for the justification of the acceptance of the tender was that the Marconi system was the only one which had actually demonstrated its capability of carrying out the work required. In reply to questions, Mr. Preece stated that he had never done work for the Marconi Company, but he had done business with them on behalf of the Crown Agents, and in every case the orders were placed with the Marconi Company because their tender was much more satisfactory and cheaper than the tender of other companies. The Poulsen people claimed that they could work satisfactorily with less area than the Marconi Company, but they had not

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proved that they could do so, and he was inclined to doubt the claim. Asked whether he considered it fair that in certain eventualities the Marconi Company should be allowed to see what other companies were doing, he replied in the affirmative. The Marconi Company—as everybody acknowledged, he said—held the master patents for wireless, and the probability was that any new invention might infringe one of these master patents.

Mr. Beach Thompson, president of the Federal Wireless Telegraph Company of the United States, occupied the witness-chair on November 14th. In his evidence before the Committee he said that his company were working the Poulsen system, and the longest distance over which they were working the system both day and night was about 950 miles, between San Francisco and El Paso. They were now working all night and for a portion of the day—that was to say, until 10.30 a.m.—from San Francisco to Honolulu, a distance of about 2,400 miles. In reply to Mr. W. Redmond he said that he was informed that there was a company recently formed in England which owned and controlled the rights for the British Empire for the Poulsen system. Asked whether the Poulsen system communicated freely between San Francisco and Honolulu in the daytime, he replied that they had not got the equipment that they wanted to give them—what he would call a first-class commercial service all day long. He had no doubt that it could be done, but it had not been done commercially. He thought that the system had been proved, but, asked for evidence, of the proof, he replied that it depended altogether on what one meant by proof.

In reply to further questions, he admitted that he had not yet been able to get messages from San Francisco to Honolulu in the daytime. He further admitted that the United States Government had guaranteed him nothing, and had made no contract with him, and that his future relations with the Government of the United States depended entirely on whether they were satisfied with the working of his stations once they were equipped. Asked why, if he could send long-distance messages by night he could not do it in the daytime, he admitted that he could not tell. Pressed to state definitely the longest distance over which his company had been able to work a regular service, the reply was 1,150 miles as the crow flies, between San Francisco and El Paso. As a result of measurements made on the map by members of the Committee, it was found, however, that the distance between these two places was less than 1,000 miles. In reply to further questions as to whether there was any difference in the perfected system which he had been describing to the Committee as working in America, and the system offered to the British Government on behalf of the Poulsen Syndicate, witness said he was not able to answer because he did not know what was offered to the British Government on behalf of the Poulsen Company. There was nothing in the correspondence with the United States Government to show that they were more anxious to secure his company's inventions than those of any other company. On some occasions the most surprising results in long-distance telegraphy had been obtained with his company's system which it had not been found possible to repeat afterwards.

Sir H. Roberts pointed out that what the Committee had to consider was the position of witness's system at the time the British Government made its contract with the Marconi Company, and he asked witness whether it was clear that the ultimate distance he had worked for over a continuous service was the distance from San Francisco to El Paso. Mr. Thompson replied: "I refuse to answer that question definitely; I do not think so. I refuse to take for granted that the only thing done is the only thing that can be done." The Hon. Neil Primrose asked witness why, if he had such confidence in his system working continuously over a long distance of 2,000 miles, he did not put up stations, and the reply was: "When I took this up I told the United States Government it was worth investigation, and that it was worth spending three or four hundred thousand dollars to investigate it. I said: 'If you will come in with me I will carry on the investigations. It will take a year or two.' A year ago I said to them: 'I have proved certain things, but before I am willing to say it is absolutely reliable it must go into the public service and stand the test.' That has been going on ever since." Mr. Primrose remarked that he thought it proved that witness could not do continuous commercial work at all times over 2,000 miles. Mr. Beach Thompson explained that he had come to London to negotiate an agreement with the British Poulsen Company, and partly for vacation; but when he found that the patent rights had been sold to a company whilst he was actually on his voyage from America, "the interview closed very shortly." His company had not sold any of their patent rights to anybody in this country, and had no intention of doing so.

The chairman pointed out that the witness was called on the suggestion of the Universal Radio Syndicate, Ltd., who desired it to be understood, however, that Mr. Thompson was not directly interested in their company.

On November 20th the chairman stated that

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he had received a letter from Mr. Beach Thompson dated November 18th, in which the writer said :

" It may be of interest to your Committee to know that I have received information from home concerning our work between San Francisco and Honolulu on the dates beginning November 7th and continuing November 15th, including the two days I was testifying before your Committee. . . . My information now shows that at the time my testimony was given we were in continuous communication between San Francisco and Honolulu at all times of the day, and had been since November 7th, using 40 kilowatts of power, and the new design of Poulsen generator."

The chairman remarked that he had also received a communication from the Post Office containing the following message on November 15th :

" The Under-Secretary of State for Foreign Affairs presents his compliments to the Secretary of the Post Office, and by direction of the Secretary of State transmits herewith copy of the undermentioned paper :

" ' Paraphrase of telegram from Consul General Ross, San Francisco, November 15th, 1912. Poulsen wireless communication to Honolulu.

" ' In reply to your despatch of October 24th, I am informed by the Poulsen Wireless Telegraph Company that they have not yet succeeded in establishing communication with Honolulu by day.' "

This direct contradiction on a matter of fact was subsequently severely commented upon by several members of the Committee, who questioned Sir A. King upon them, and drew from him the remark : " I would sooner take the word of the British Consul."

Sir David de Villiers Graaff, Bart., the Minister of Public Works and Posts and Telegraphs of the Union of South Africa, gave evidence on Monday, November 18th. He said that during the Imperial Conference in June, 1911, he was fully informed of the reasons which had led the British Government to decide that a chain of wireless stations, owned and worked by the State, should be constructed to link up the various parts of the Empire. The Government of the Union of South Africa was then, and still was, in complete accord with the Imperial Government in regard to the great importance of the scheme, both from a strategic and commercial point of view. Through their High Commissioner his Government had kept in close touch with the deliberations which followed in respect of the best method of giving effect to the purpose with negotiations for the station, also of the terms of the proposed contract with the Marconi Company. In July last his Government expressed its cordial approval of the arrangements which had been made. In coming to this conclusion, the Union Government attached great weight to the fact that the Marconi Company, alone of all wireless companies, so far as his Government was aware, was actually carrying on a long-distance wireless service both day and night. His Government always held, and still held, the view that the delay and expense that would be involved in making experiments to ascertain whether another system could carry out an effective and continuous service, could not be justified—especially seeing that it was possible that the trial might fail—when time and money would have been wasted. Sir David Graaff said his Government felt so strongly on this point that they would not have adhered to the Imperial scheme if the system adopted had not been one which had been proved by continuous long-distance service. He further said that his Government would withdraw from the scheme if the Imperial Government were to adopt a system which would involve expense and delay before it would be declared to be of proved capacity for the work. His Government gave great weight to the fact that, under the agreement with the Marconi Company, there was the definite guarantee that payment for the work to be undertaken by the company was only to be made upon the satisfactory erection of the installations, and definite approval as to the capacity of the installations for carrying long-distance messages.

He was quite satisfied with the arrangements that had been made by the Post Office, and, in his opinion, the best arrangement had been made to serve the best interests. The present scheme was, in his opinion, an improvement upon the earlier schemes submitted. Sir David Graaff added that in South Africa the Government had a technical staff, who had obtained particulars from another company, and had arrived unanimously at the conclusion that the Marconi Company, and the Marconi Company only, was the proper company to give the contract to if they wanted to ensure success.

The chairman then finally intimated to Sir David that he wished to ask him two questions. " You heard Mr. Beach Thompson give his evidence last week ? "—" Yes."

" If you had to make a contract again, having heard his evidence, would you still join in giving it to the Marconi Company ? "—" Absolutely, and all the more so after having heard his evidence—much more so."

Mr. Falconer asked why, and the answer was :

" Because I think he admitted he was simply in the experimental stage—that his schemes were still in the air. We have a good deal of that sort of thing out our way, and we do not take notice of such people."

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## Parliamentary Notes

OPERATORS ON LINERS.—The President of the Board of Trade was asked about the number of wireless operators carried on board the P. & O. liners; also whether the Board would issue regulations that every ocean-going steamer fitted with the Marconi apparatus should carry at least two operators.

Mr. Buxton agreed that only one Marconi operator was carried on certain of the P. & O. vessels. The Board of Trade had no power to issue regulations as to the number of operators to be carried, but, as he had already stated to the House, a Bill requiring certain ships to be provided with wireless telegraphy apparatus had been prepared, and the question of operators would be dealt with in it.

* * *

PATENTS.—Mr. F. Hall wanted to know on what grounds the letters patent in respect of certain improvements in wireless telegraphy granted to Mr. Ettone Bellini were revoked; and whether any of such improvements had been or were proposed to be embodied in the Marconi system.

Mr. Buxton assumed that the patent referred to was No. 11339 of 1911. This patent was revoked by the Comptroller-General of Patents on September 28th last in consequence of an offer made by the patentee to surrender the patent under the provisions of section 26 (3) of the Patents and Designs Act, 1907. The reason given by the patentee for making this offer was as follows: "That the invention is found to be wanting in novelty." Mr. Buxton had no official information as to the last part of the question.

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THE WIRELESS CHAIN.—The Postmaster-General was asked by Sir R. Adkins whether the first Marconi tender was signed in January last; whether none of the Dominions had entered into a contract with the Marconi Company; and whether he had himself given currency to either or both of these statements.

Mr. Samuel replied that these statements were totally false, like much else that had been written about the contract. No agreement of any kind had been made with the Marconi Company with respect to these stations until March 7th, 1912, when their tender in general terms had been accepted, while the contract itself was signed on July 19th. He repeated that he had made no reference to any tender having been signed in January. The South African Government was participating in the contract, and the statement alleged to have been made with respect to the Dominions was a mere invention.

* * *

WIRELESS TELEGRAPHY ON BRITISH SHIPS.—Mr. Peto asked the Secretary to the Admiralty whether, in respect to the Board of Trade notice to masters and owners of British merchant vessels which had been issued at the request of the Lords Commissioners of the Admiralty, directing their attention to the necessity for arranging for periodical practices in wireless telegraph communication between His Majesty's ships of war and ships of the British mercantile marine for the purpose of ensuring efficient and reliable communication when required, he was aware of the fact that there were aliens commanding and officering ships of the British mercantile marine.

Mr. Lambert replied that the notice in question had been issued with the object of ensuring that any communications which might be considered desirable between the Royal Navy and the mercantile marine might be efficient and reliable when the occasion arose. No inference was to be drawn from this as to the distribution of confidential information.

* * *

WIRELESS IN THE ARMY.—The Committee recently appointed by the Secretary of State for War to consider Wireless Telegraphy in the Army have commenced their proceedings, the first meetings being held at the War Office.

The members are Sir Henry Norman, M.P. (Chairman), Colonel R. D. Whigham, D.S.O., of the General Staff; Commander A. E. Silverton, R.N., of H.M.S. "Vernon"; Major R. H. H. Boys, D.S.O., R.E., of the Department of Fortifications and Works; Lieutenant-Colonel Hippisley, of the Territorial Force; Mr. E. Russell Clarke, of the Inner Temple; and Captain A. M. Henley, of the General Staff, secretary. The proceedings of the Committee are confidential.

* * *

It is understood that the New Zealand Government have under consideration legislative action compelling all steamers trading with the islands for passenger traffic to carry wireless equipment.

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# The International Radiotelegraphic Convention

## Results of the London Conference

THE third International Radiotelegraphic Convention, which met in London on June 4th, and concluded its deliberations on July 5th, came to an agreement as regards several important features which the Berlin Convention of 1906 left undecided.

Thirty-seven countries were officially represented by 149 delegates, in addition to the companies, whose representatives were entitled to speak, but not to vote. The meetings were not open to the public. Sir Henry Babington Smith presided. French was the official language. We will give a brief *résumé* of the results of the conferences.

The Convention, which requires ratification, is divided into two parts—the Convention proper, with an additional final protocol, and the Règlement de Service. The Convention consists of twenty-three articles. The definition of coast stations and of board stations (not comprising permanently anchored ships) remains as before. Article 3 enacts an exchange of messages, irrespective of the system, between coast and board stations, and between board stations. It does not force coast stations to a like exchange with other coast stations; but that point may be left to the next Convention, which is to assemble at Washington in 1917. There is also a clause added to this article which provides that systems which cannot enter into communication with other systems may be used, provided that this incapability be inherent in the system, and not due to arrangements especially made with the object of preventing intercommunication. The following articles, referring to the transmission of the received messages by the telegraph and cable lines, to exchange of information on the service, and to the maintenance of a service such as not to disturb other stations (Article 8), do not differ from those of 1906. Article 9 demands absolute priority for distress signals, no matter of what origin—that is to say, whether they come direct from a ship or indirectly from coast stations. Article 21 of the Règlement adds that the transmission of such signals, and its continuation and stoppage, must take place in accordance with the desire expressed by the ship in distress. The distress signal is . . . – – – . . . (S.O.S.).

### Right to Vote

The fees to be paid for a radiotelegram comprise a sum payable to the coast station and a board tax, in addition to the further sums due for forwarding the telegram on and to special transit charges. All further questions, so far not in the competency of the Bureau International de l'Union Télégraphique, are to be settled by additional conferences of delegates. At these conferences each country has one vote only, but colonies count as separate countries, with the restriction that the number of votes for any nation must not exceed six. Thus Great Britain has one vote, and additional votes for South Africa, Australia, Canada, East India, and New Zealand. Disputes between different States as to the interpretation of the Convention and to any modifications, are to be decided by arbitration.

Article 21 is important. It prescribes that the Governments may erect military and naval stations, and special stations for service between fixed points, which are not subject to the general rules; but such stations must take up distress signals, and must not disturb other stations. When these stations also accept public messages across the sea, they are bound by the ordinary regulations; the regulations for the service between fixed stations are left to the respective country. The Convention is to enter into force on July 1st, 1913. The final Protocol adds that the United States decline to sign any rule as to the tariff, since their telegraphic service is mainly private, and that Canada reserves its right to impose a total maritime tax for messages coming from the United States and intended for ships.

### Service Regulations

The service regulations demand (Article 2) that each coast station shall be equipped with apparatus for working with two wave-lengths, 300 m. and 600 m. Other wave-lengths may only be used with the sanction of the respective Governments, but no wave-lengths intermediate between 600 m. and 1,600 m. are to be used in public service. Stations which exclusively enable ships to fix their position are to work with waves of 150 m. For most ships the 600-m. wave-length is to be regarded as the normal one, and every ship must be able to receive with that wave-length during service hours. So far as possible messages should be replied to with the same wave-length as received. The International Bureau will publish at intervals lists of all the stations, with their full "nomenclatures," comprising posi-

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tion, name, range, etc., of station, wave-length, hours of service, and tariffs. This nomenclature distinguishes private stations, P; public stations, P G; restricted public stations, P R; official stations, O; permanent service stations, N; stations working with indefinite interruptions, X (Articles 4 and 5). The exchange of superfluous signals is interdicted, and experiments should be conducted only when not interfering with other messages, and then with special wave-lengths and with the smallest possible expenditure of energy (6). The waves should be pure, and direct antenna-sparks not be used, except by stations not commanding more than 50 watts of primary energy. Apparatus should be able to maintain a minimum speed of twenty words of five letters per minute. New stations should be equipped so as to be able to work at several ranges smaller than their normal range, the minimum being 15 nautical miles, whilst special stations for enabling ships to take their bearings (radiophares) should be limited to a range of 30 miles.

**Operators' Certificates**

The power of the special generator for the instrument should not exceed 1 kilowatt, measured at the binding screws, except when a ship is at least 200 miles from any coast and anxious to send long-distance messages. No coast station may be erected or worked without permission of the respective Government, and the licence must be shown to the proper authorities in foreign ports if called for. The Government (Article 10) has also to license the operator, and two kinds of certificates are distinguished. A first-class certificate is given to a man possessing sufficient practical and theoretical knowledge of the apparatus and of the service regulations, and sufficient experience to maintain the regulation rate of transmission. A second-class certificate is to be granted to operators who cannot maintain full speed; they may be employed as assistants or as operators on vessels which merely wish to telegraph in their own interest—*e.g.* fishing craft, The operators are subject to the orders of the commander of the ship. All stations classified for permanent service (*a*) or for service for certain hours (*b*) must be equipped with an auxiliary radiotelegraph outfit, comprising an independent source of power capable of maintaining transmission for six hours over a range of 80 or 50 miles (permanent (*a*) or limited (*b*) services). Cases of complaints have to be examined by the authorities, and the licences of the operator or of the station to be withdrawn after repeated offences.

Most of the remaining articles are of smaller general interest. As regards the service hours (Article 13) the important coast stations (*a*) should be open day and night, and ship stations be open likewise, or during their special hours (*b*); vessels of the third category (*c*), having no definite hours or service, are not subject to any definite rules. Articles 14 to 19 deal with the charges, Articles 20 to 35 with transmission, Articles 36 and 37 with the forwarding, Articles 35 to 40 with special messages (prepaid replies, urgent messages, etc., are now permitted).

**Weather Telegrams**

A few special features should be mentioned. According to Article 24 the customary call sent by any ship to a coast station which it is approaching should be omitted in waters which, like the English Channel, are much frequented. Such a call should not be made before the apparatus is well adjusted and before the station is within the normal range of the ship and within 75 per cent. of the range of the coast station. In making the call the ship should wait for a pause. If that be impossible, the ship should in general stop sending when a protest of interference comes from some quarter. A powerful station (Article 27) first should send in all cases the signal — — . . — — three times with the smallest possible amount of energy at least 30 seconds before putting on full power. Various restrictions are made with regard to more or less unnecessary matter which should not be telegraphed under ordinary conditions. Article 45 regulates the transmission of weather and time signals.

Weather telegrams should not exceed a length of twenty words, and time signals and weather signals (to be sent in the order just stated) should not take up more than ten minutes together. During this period other messages should temporarily cease.

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"We are informed by a trustworthy correspondent that the Marconi Company has no intention at present of undertaking the manufacture of gas fittings."—*The Electrician.*

Marconi's Wireless Telegraph Co., Ltd., gave a donation of £10 10s. towards the Lord Mayor's fund for the relief of sufferers by the recent floods in Huntingdonshire.

Professor J. Wertheimer, D.Sc., delivered a lecture on "Wireless Telegraphy" in the great hall of the Merchant Venturers' Technical College, Bristol, on October 25th. Dr. Wertheimer said that when he gave the first lecture in the West of England on the subject of wireless telegraphy, fourteen years ago, many of his friends asked him whether the discoveries had any commercial value; nowadays no one doubted that this was the case.

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# The Post Office and Safety at Sea

THE inquiry which has recently been held at the Board of Trade by the Derelicts Committee regarding the steps taken to report the position of bergs and derelicts, as well as meteorological conditions, has elicited much interesting information. While there was a marked difference of opinion amongst witnesses regarding the prevalence of these dangers, all were agreed on the best course to be pursued in dealing with the trouble, the unanimous verdict being that it is the duty of every ship-master, if he come in contact with a derelict or iceberg, or if he experience severe weather, which is likely to be dangerous to other vessels, to report the fact to the authorities, and for this purpose wireless telegraphy is the only possible means of communication. That this would be the verdict of anyone competent to judge on these matters was a foregone conclusion ; but the chief interest of the inquiry lies in the evidence given as to the resources available for the adequate dissemination of such information. The outcome is that the efforts of the Post Office in this connection do not appear in a very favourable light ; but not, we must believe, from any intentional desire on the part of the authorities to evade this important duty, nor from any want of consideration on the subject.

### A Change of System

One of the most important witnesses at the inquiry was Captain Mathias, who gave testimony on behalf of the Liverpool Steam Ship Owners' Association and the Mercantile Marine Service Association. He alleges that since the Marconi wireless stations have been taken over by the Post Office a complete change in system has been introduced with reference to charging for " danger " telegrams. When the stations were in private hands there was a give-and-take arrangement between the parties, and messages obviously in the public interest regarding derelicts, vessels in distress, dangerous ice and other obstructions, as well as bad weather, were accepted without charge, the obvious result being to put a premium upon these reports, and to prevent captains, in making them, from being in any way influenced by considerations of economy. With the change in management, however, the officials strictly carry out the rules and tax every word transmitted.

It may turn out that to some extent Captain Mathias may be mistaken in his estimate of the attitude of the Post Office officials, but his statement was both categorical and circumstantial, and the actual instance he gave will take a good deal of contradiction to explain away. On one of his recent voyages he desired to know from a station near Liverpool what was the nature of the weather outside the river, and was met with the curt answer that he could have the information if he chose to pay for it. This was not a case of reporting a derelict, it is true ; but the witness was not less emphatic in his declaration that every word had now to be paid for. At the same time Captain Mathias laid stress on the difference in this respect between the officials in this country and the United States and Canada, the " wireless " people in America being only too anxious to afford captains of ships every possible information likely to assist in safe navigation.

### The United States and Derelicts

In support of his contention, he stated that the United States employed three vessels to destroy derelicts off the coast, and these vessels operated as far as 400 miles off the coast. A certain number of derelicts escaped and drifted into the trade routes. The derelict destroyers searched for derelicts all winter. They were fitted with wireless telegraphy, and were in constant touch with the wireless stations on the coast. They were of about 1,500 tons each, and carried large and efficient crews. At the same time, he added, that the American coast was extremely dangerous, and there was nothing like it round the United Kingdom.

Captain Mathias's evidence was to some extent corroborated by the Postmaster-General, who, on October 30th, in the House of Commons, replied to a question put by Mr. Pretyman as to whether a charge of 5s. was made for radio-telegrams furnishing local weather reports to vessels at sea.

Mr. Samuel stated in his reply that the charge referred to was made to cover the cost of the radio-telegram conveying a weather report to a ship, as well as the radio-telegram asking for information, and was below the ordinary rates. The Marconi Company, when they owned the shore stations, supplied reports of this kind free of charge. On the other hand, the International Conference on Wireless Telegraphy, which recently sat in London, resolved that this service ought not to be gratuitous. Radio-telegrams relating to the position of derelicts and other objects dangerous to navigation were transmitted to ships gratuitously from the Post Office stations. As at present advised, he saw no reason why the

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same privilege should be granted in the case of weather reports at the cost of the taxpayer.

**The Charge for Meteorological Information**

A little later an interesting correspondence (dealing more particularly with the meteorological side of the question) took place between the President of the Board of Trade and Mr. J. Smith Park. In one of his letters Mr. Buxton, after quoting—practically verbatim—the above-mentioned report of Mr. Samuel, adds that "operators at coast stations under the charge of the General Post Office have been instructed to give information as to weather conditions without raising any discussion as to charges, which are subsequently collected from the owners of the ships concerned."

In reply, Mr. J. Smith Park asks the President of the Board of Trade whether it does not strike him "as incredibly mean that the British Government, representing as it does the greatest maritime nation in the world, should make any charge whatever for informing ships arriving off our coasts as to the state of the weather." He points to the pressure put upon shipowners to fit their vessels with wireless telegraphy, and to the British Meteorological Office's invitation to the masters of ships fitted with wireless telegraphy to transmit to them by wireless information as to weather at sea, a request which is freely complied with.

**Derelict Statistics**

Coming back again, however, to the subject of the derelicts, some remarkable statistics were afforded at the inquiry by Rear-Admiral E. F. Inglefield, secretary of Lloyd's, regarding the limited services of the Post Office. He declared that during 1911 Lloyd's received reports of seventy derelicts, all over the world, and sixty-one during the present year up to October 19th. These were from masters, who were all under an obligation to report derelicts and wreckage to the agent or sub-agent at the nearest port of call. Reports were also received from the Board of Trade, Trinity House, the Customs, and the Receiver of Wrecks, and some of these reports were of derelicts which had not been reported by masters. The information was published broadcast by Lloyd's. There were 1,705 British and foreign steamers fitted with wireless telegraphy apparatus, and reports were now also received by that means.

In 1911 twenty-four such reports of derelicts and dangers to navigation were received, and twelve in the present year up to October 21st. Practically all these reports were received from ships in the Atlantic. Reports were also found in the British and foreign Press. The Post Office had taken over Lloyd's wireless stations, and they distributed a limited amount of information which they received. If the Post Office received a wireless message from a ship they would retransmit to Lloyd's on payment of the ship's station charge, and on Lloyd's paying the overland charge. The Post Office gave practically no assistance at all to Lloyd's. In the United States and Canada the reporting of derelicts was regarded as a national duty, and here it was laid upon individual shoulders or upon Lloyd's. The committee of Lloyd's believed that reports of derelicts reported by a ship at sea and received at the wireless stations should be transmitted by the Post Office absolutely free.

Several vessels struck the masts of the sunken ship "Oceana" off Eastbourne, although the wreck was well marked, and they signalled every ship going up the Channel until the wreck was dispersed. It was very difficult to destroy a derelict even after it had been found. The number of floating derelicts was decreasing year by year, as the number of wooden vessels was becoming less. Derelicts were generally wooden ships. It would be an advantage to mariners if one authority, instead of several, were charged with the duty of disseminating information as to derelicts. At present the Meteorological Office, the Board of Trade, the Admiralty, the Post Office and Lloyd's distributed the information, and he suggested that Lloyd's was the best agency to distribute such news.

**Conclusions**

With such evidence as this before them there can be little doubt as to the attitude which the committee will adopt in their report. There is proof enough and to spare that there are serious faults in the present system of assisting navigation by wireless reports, but at the same time it is equally evident that these faults are easily rectified. It is manifestly to the interest of everyone that masters of vessels should be possessed of every item of news calculated to enable them to avoid ocean and river dangers, and the State owes it to the community to see that no hindrance is placed in the way of the acquirement of such knowledge. There are thousands of smaller vessels which, if they were fitted with "wireless," would certainly to some extent be influenced by the fact that even a mere query as to the weather would entail charges on their masters, and it does not seem right that shipmasters should be placed in this position.

At the same time the attention of those authorities should be drawn to the suggestion of Captain R. Deane, a representative of the Commissioners of Irish Lights, who in the course of his evidence before the committee pointed out that it would be an advantage if some of the lighthouses and light vessels were equipped with wireless telegraphy for promptly reporting derelicts and wreckage.

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## War Notes

THE attention of the public and of the Press the world over is so deeply obsessed by the rapid development of military events in the Balkans, and, at the moment of writing, by the extreme delicacy of the diplomatic situation in the Near East, that there has been no time to think of certain details of military equipment which are decisive factors in warfare. The *role* played by wireless telegraphy in the present war may seem, to the casual observer, a relatively small one; the close student of the Press, however, cannot fail to notice that the various wireless stations in the vicinity are performing services of immense value. The nature of the work of these stations is such that their operations do not come much within the limelight, and, even if they did, it is doubtful whether they would be able to divert attention from the startling events that are occurring with breathless rapidity at the seat of war.

* * *

But when the clash of battle has subsided and the sword is replaced in its scabbard, the historian who sits down to record facts and to draw deductions for the benefit of students of military tactics will be able to shed an illuminating ray upon the part played by wireless telegraphy in the war. It will then appear how much depended upon the rapid means of communication made possible by the genius of Mr. Marconi and those who, with him, have brought such renown to Marconi apparatus, and made the term synonomous with wireless telegraphy. For it is well known that several of the combatants possess numerous Marconi portable stations of various types and ranges, and that in Bulgaria, Turkey and Greece there are high-power Marconi stations, each of them performing valuable work.

* * *

The *Matin* on November 12th, in a despatch from Constantinople, published the interesting item of information that the French Admiral Dartige du Fournet had some difficulty in getting into touch with the Eiffel Tower by means of his wireless installation, and he had to make use of the "Jules Ferry" as a relaying station. The British cruiser "Weymouth," on the other hand, was daily in direct communication from the Aegean Sea with England. The maintenance of direct communication in spite of the disturbance caused by the various warships endeavouring at the same moment to communicate with their respective Governments, and the failure of the "Leon Gambetta" to get through to Paris, is an incident fraught with great significance.

The chief stations are Varna on the Black Sea, owned by the Bulgarian Government, Constantinople and Athens. All these stations were built by the Marconi Company, and are worked by their respective Governments. None of them have so far been used for the transmission of commercial messages, and it is unlikely that they will be permitted to transmit ordinary Press or other telegrams. Notwithstanding this, some important communications have been received in London by wireless. Thus on November 12th Mr. M. H. Donohoe, the famous war correspondent of the *Daily Chronicle*, sent a message by wireless from the s.s. "Dacia," in the Black Sea, to the effect that Turkey was prepared to open negotiations with the allies for peace. The *Daily News & Leader* correspondent marconigraphed on November 15th from the "Principesa Maria" a rumour concerning a mysterious loan.

* * *

Some days ago there was a report that the Turkish authorities in Constantinople entertained grave fears with regard to the safety of Adrianople as wireless communications between the fortress and the capital ceased. This leads to the belief that one of the Marconi portable stations, supplied to the Turkish Government some time ago, was used for communicating between Adrianople and the capital, as there is no other station at the first-named city. Apart from this, there is nothing in the Press reports to indicate to what extent the portable sets supplied to the various countries engaged in the war have been used. Nevertheless, it is safe to assume that considerable use was made of these stations; otherwise it is difficult to see how the vast armies, stretching as they did along hundreds of miles, could have worked together so smoothly. Thanks to wireless telegraphy the commander of the forces would have less difficulty in keeping in touch with his various units than had Wellington at Waterloo, though the latter's line was to be measured in yards instead of in miles.

---

The United States Naval station erected at Fort Meyer, Arlington, Va., was recently tested. The feature of this station is the three steel towers connected at their tops by a series of 23 wires by which messages will be radiated and received. The towers are ranged 400 feet apart at the corners of a triangle foundation around a central receiving and sending station. The equipment comprises a 100 k.w. motor-generator set, on the shaft of which is a synchronous rotating spark.

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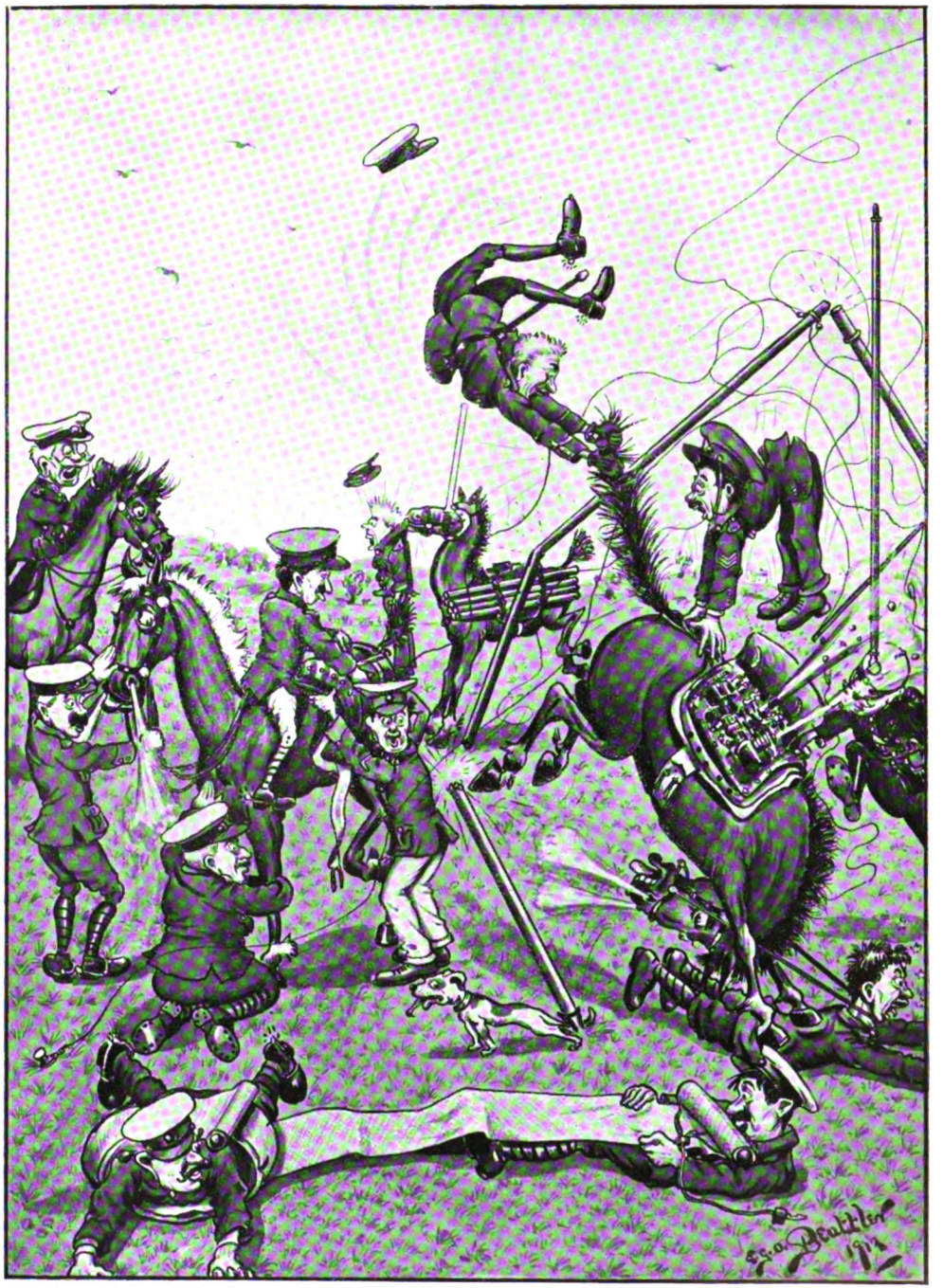

TROUBLES WITH THE CAVALRY WIRELESS STATION.

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THE MARCONIGRAPH

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The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

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**OPERATORS, NOTE.**—We are now making up small Receiving Units only, in neat leather cases, approximate size, 10 inches by 9 inches by 3½ inches. Just the thing for your own private use when on leave. Full particulars from **Graham & Latham, Ltd.**, Military Engineers, 104 Victoria Street, Westminster, S.W.

### The Share Market

London : November 25th.

Dealings in the share market have been very restricted since our last issue owing to the grave fears that have been entertained as to the general international situation. The shares of the various Marconi issues have been little influenced by the general depression, no doubt owing to the fact that they are very strongly held, and also that the favourable course of the Inquiry has brought in a good many buyers.

The prices as we go to press are : Ordinary, $5\frac{3}{16}$ ; Preference, $4\frac{3}{8}$ ; Canadian, 21s. ; Spanish, $1\frac{1}{8}$ ; American, $1\frac{3}{8}$.

The shares of Marconi's Wireless Telegraph Company are now quoted on the Milan Exchange, and the shares of the Marconi Wireless Telegraph Company of America are quoted on the Amsterdam Bourse.

### The Patent Situation

Two statements have appeared in the newspapers during the past month. The first, which was published on November 4th, was to the following effect :

> "In view of the position assumed by the Commonwealth Government in connection with wireless matters, and particularly having regard to the building of stations on a system which is declared by experts to be an infringement of patents now existing, the two companies principally interested—viz., Marconi's Wireless Telegraph Company and the Australian Wireless Co., Ltd. (Telefunken system), have agreed to sink their differences and take joint action to secure their rights and future protection of their patents."

This was followed on November 13th by the announcement that :

> "Messrs. Siemens Brothers, acting in England for the Telefunken Company, have admitted the validity of the Marconi patent No. 7777 of 1900, and arrangements have been come to by which the actions brought by each company are now at an end."

### Patents in the United States.

The United States Patent Office at Washington has recently decided to award priority of invention to Mr. Marconi over the wireless inventions of Prof. Reginald A. Fessenden. The inventions specified involved a transmitting apparatus for wireless, which Prof. Fessenden contended contained features substantially the same as those in the Marconi patent, while application for a patent had been filed by him as early as 1906, whereas Mr. Marconi's patent was only issued on September 28th, 1909. The Patent Office, however, found that none of the subject-matter of the

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Marconi invention were to be found in the apparatus of Prof. Fessenden, and decided the award must be to Mr. Marconi.

The Fessenden wireless patents are owned by the National Electric Signalling Co., of Pittsburg, who entered an appeal in the United States Circuit Court of Appeal against the judgment of the Patent Office, but the case was dismissed.

Two suits for injunctions and damages for the infringement of wireless telegraph patents have been brought in the United States District Court of California by the Marconi Wireless Telegraph Co. of America against the Federal Telegraph Co., which operates the Poulsen system of wireless telegraphy in a small way.

The patents involved cover basic inventions of Guglielmo Marconi and Sir Oliver Lodge. Two of the patents have already been adjudged valid and held to have been infringed by the United States District of New York.

The bills of complaint in these suits allege that the Federal Telegraph Co. is making and using the apparatus and system of these wireless telegraph patents, and claim that the Marconi Company is entitled to an injunction restraining the Federal Company and its associates from the infringement of the patents, and that the Marconi Company is entitled to a large amount of damages and profits which it has sustained by reason of the Federal Company's infringement.

### Transpacific Wireless

Some correspondence on the above subject appeared in the *Electrician* of November 1st. Mr. Elwell, the chief engineer of the Federal Telegraph Company, in a letter to the editor, took exception to the word "claim," which appeared in the Marconi Company's note published in the *Electrician* of September 6th. The use of the word "claim," he said, gave an entirely erroneous idea as to the present status of the San Francisco-Honolulu service of the Federal Company, and he asserted that the stations in question were opened "for regular commercial service" on September 5th, 1912. Mr. Elwell added that at his company's San Francisco station they were using only 30 kw., whereas, "according to their announced plans, the Marconi Company will use 500 h.p. in their proposed stations at the same points."

The letter, of which the foregoing is a summary, was courteously communicated by the editor of the *Electrician* to Marconi's Wireless Telegraph Company, whose managing director, Mr. Godfrey C. Isaacs, sent the following reply:

"When we speak of a commercial service, we understand it to be a continuous service; one which works not only in the night time, and when atmospheric conditions are favourable, but which is able to work at all times during the day and night in all weather conditions. The Federal Telegraph Company are only able to communicate between Honolulu and San Francisco in the night time with their 30-kw. stations, and this not without interruptions. We are also able to, and do, communicate with Honolulu from both San Francisco and Seattle, which is farther, with 10-kw. Marconi stations, but we do not claim a commercial service. The long experience which we have had, and the knowledge of the necessities of the conduct of such a service, calls for a station of a very different construction, and one of which the Federal Company has neither knowledge nor experience."

### "The Marconigraph" and its Subsidiaries

Contemporaneously with the world-wide extension of wireless telegraphy has grown a public demand for information concerning wireless telegraphy. It was to satisfy this demand that THE MARCONIGRAPH was established in April, 1911, and the thousands of readers who have followed its career from the beginning have been able to note the remarkable progress which it has achieved. Combining the best features of magazine, review, and newspaper, it has acquired a unique place in journalism, and has been the means of conveying information to almost every country in the world, appealing alike to the scientist, the engineer, the business man, and that elusive personality, the general reader. To supplement its usefulness abroad foreign editions have been founded. The first of these was the *Telegrafia sin Hilos*, published in Madrid. This has now reached its fourteenth monthly issue, and continues to show signs of increasing importance and prosperity in Spain and Spanish-speaking countries.

An American edition, bearing the same title as its parent publication, has just made a successful first appearance in New York. That number contains many interesting articles and much up-to-date information, and the general appearance of the magazine is deserving of the warmest praise. We heartily wish it the success which it merits.

The *Messenger of Wireless Telegraphy*—a Russian edition, to be published in St. Petersburg—will appear in a few days, and, in addition thereto, we hope shortly to welcome another ally in wireless journalism. So important has this enterprise now become that, in spite of the establishment of foreign editions, the parent MARCONIGRAPH continues to make immense increases in circulation, which now amounts to many thousands per month.

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## Monthly Miscellany

THE scheme for the establishment of a trans-Atlantic wireless service between Norway and Sweden, outlined in the October issue of THE MARCONIGRAPH, has been carried a stage further. It was reported on November 15th that the Norwegian Government had approved the contract entered into between the Marconi Company and the Norwegian Director-General of Telegraphs for the erection of a high-power station in Norway. The other station will be erected in the vicinity of New York.

* * * *

A libel action brought by Mr. G. Marconi, chairman, and Mr. Godfrey C. Isaacs, managing director of the Marconi Company, against the responsible editor of the newspaper *Die Wel am Montag*, which is a paper of a sensational character published on Monday mornings, began on October 30th. This paper asserted that two marconigrams were sent from an American land station to the "Carpathia" with orders to the operator on board that ship to keep back all news about the accident; the inference being that Mr. Marconi withheld the news in order to sell it to an American newspaper for a large sum.

The defendant, whose name is Alfred Scholz, was brought from Tegel Prison, where he is serving a sentence for blasphemy.

The wireless operator, Mr. H. S. Bride, is a witness in the case. The hearing on October 29th was postponed in order to enable the production of the Senate Commission's report. It was further decided to examine the chief telegraphist of the "Carpathia," Mr. Cottam, either personally or by commission, and to find out the name of the American coast station operator in order to obtain his evidence also.

* * * *

The selection of a subject for a presidential address is never an easy one, and there is a great temptation to devote such an address to the discussion of general matters rather than to those of which the new occupant of the chair has special knowledge and experience.

In his inaugural address before the Institution of Electrical Engineers the new president, Mr. W. Duddell, F.R.S., touched upon a great variety of subjects, upon all of which, however, his familiarity with the details enabled him to illustrate and to refresh his remarks by examples. He spoke as a physicist and as an electrician rather than as engineer, and rightly deplored the tendency to confine the subjects discussed before the Institution—mainly the generation, distribution, and the cost of electrical energy. He put in a plea for more papers being read on other subjects, and, taking as a particular instance telegraphy and telephony, he pointed out that during the last ten years only twelve papers dealing with these subjects had been read out of a total of four hundred. Before leaving the subject of telegraphy, Mr. Duddell reviewed the progress that was being made in the art of wireless telegraphy, and he recalled to the minds of the members the great interest that was awakened when, in 1899, Mr. Marconi read his paper before the Institution. Since that date there have been a number of papers dealing with different parts of the apparatus, but he complained that a general review of the subject had not been laid before the Institution. We will deal fully with Mr. Duddell's remarks in this section of his address on another occasion.

* * * *

The necessities with regard to what is now loosely called science have so changed since the establishment of the British Association for its advance, that it has become incumbent upon that body to overhaul its proceedings in relation to what may be the requirements of such an association. In pursuance of this it has been decided to appoint a committee to carry out radiotelegraphic investigations. The gentlemen invited to form the committee are: Capt. H. R. Sankey, Mr. S. G. Brown, Prof. J. A. Fleming, Prof. G. W. O. Howe, Prof. H. M. Macdonald, Mr. F. Maclean, Prof. Sylvanus P. Thomson and Dr. Erskine Murray, with Dr. W. H. Eccles as secretary. The appointment of this committee is the outcome of a suggestion made by Dr. Fleming in the course of his admirable paper before the Dundee meeting of the association. It will be remembered that at this meeting Capt. Sankey made it clear that unless such a committee could command the use of apparatus for long-distance transmission, and practically had unlimited capital, they could not obtain data to answer the many questions with which they would be confronted in the course of their investigations. To what extent the committee will be able to surmount the difficulties outlined by Capt. Sankey remains to be seen.

* * * *

Some eighty delegates representing sixteen different nations were present at the International Time Conference which was recently

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held at Paris. As a result of their deliberations a report comprising the resolutions adopted has recently been published. Among these resolutions is one which provides that the expenses necessitated by a complete system for the transmission of the exact time by wireless telegraphy should be defrayed by the various nations in proportion to the number of their inhabitants; these expenses will probably only amount to something between £16 and £80 a year for each nation. An international "Bureau de l'Heure," which is to be, as it were, the time centre of the whole world, will be established at Paris. The time signals transmitted by all wireless stations are to be identical on and after July 1st, 1913. By this date it is hoped that there will be thirteen great wireless stations in Europe, Africa and America, which will be capable of transmitting time signals over more than half the globe.

The Conference also advises that the transmission of meteorological and other scientific reports of value to agriculture, navigation, aviation, and the like should be widely extended. It further suggests that the telegraphic departments should endeavour to establish time centres in a large number of their offices, and should consider the means of giving the exact time to private persons. Finally, a provisional committee has been appointed to draft and submit for the approval of the various Governments the resolutions voted by the Conference. Until this approval has been obtained the Paris Observatory will act as the central time office.

* * * *

Dr. F. W. Dyson, the Astronomer Royal, who was the guest at the Authors' Club dinner held on November 11th, made reference to the same subject in his reply to the chairman's speech, and forecasted the possibility of wireless telegraphy superseding chronometers at sea. The Eiffel Tower, he said, daily sent out the time as far abroad as Gibraltar and the Shetlands, so that ships, if they could pick up Greenwich time in that way, really had no need for chronometers. The great map of the skies, upon which the Greenwich and other observatories of the world were engaged, was nearing completion. This great work would give the positions of millions of stars, and data which would help to solve the problem of whether or not there was a limit to the stellar universe as we saw it. Mr. H. Krauss Nield, referring to the presence of coronium in the sun, said that it would be very interesting if it could be collected on the earth. The problems of aviation would be seen in a very different aspect, for they had good reason to suppose that coronium was so light that its lifting capacity would be vastly superior to anything of which they had any knowledge. Future visits to our neighbours in the solar system, or even farther, he did not regard as an absolute impossibility. Such a prediction seemed to him no more wonderful than would have been the statement three hundred years ago that it would be possible to throw a message across the Atlantic without the guidance even of an intervening wire.

* * * *

To return to the subject of the Conference. Aviation should be greatly benefited by the clause in its report which lays particular emphasis on the urgent need for extension in the wireless transmission of meteorological reports.

For the last two years a vigorous campaign has been carried on by such aeronautical authorities as Professor Berget, Major Renard and M. Louis Capazza in favour of providing all military aerodromes with direct wireless communication with the Eiffel Tower in order that the latest weather reports might be always at the disposal of aviators and aeronauts. M. Capazza has insistently drawn the attention of aeronautical experts and the military authorities to the results of the experiments conducted by him at the International Kite Competition at Spa: a complete wireless service had been fitted up, and with the aid of an antenna carried up by a kite it proved possible to receive messages from Canada. Thanks to the weather reports received M. Capazza was able on five or six occasions to foretell the arrival of a storm and prevent the inflation and departure of a free balloon. A first step has been taken by the decision of the Minister of War that the Meteorological Office should transmit all its weather reports by telegraph to all the military aerodromes, and the Congres de la Sécurité en Aéroplane concluded its labours by voting a motion calling on the authorities to provide every aviation centre with a wireless station.

Now that the International Time Conference has also taken up the matter we may hope to see a great advance in this direction, for it is one of the utmost importance not only from the point of view of efficiency in military tactics, but for the greater safety of those engaged in an occupation which has already cost us many lives.

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The death was recorded at the beginning of last month of Mr. Victor Popp, who was for many years connected with the electricity supply of Paris, and who was interested in wireless telegraphy.

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## Correspondence

DAYLIGHT EFFECT ON RADIO-TELEGRAPHIC WAVES.

SIR,—In connection with the daylight effect on radio-telegraph signals and atmospherics, I conducted an observation at this station during the partial solar eclipse of October 10th last.

Arrangements were made with the s.s. "Kildonan Castle," lying at Port Elizabeth at a distance of approximately 380 miles direct, to send V's for three minutes each quarter of an hour from 4.15 p.m. till 6.30 p.m., whilst during the intervals we made a lengthy call to the ship.

At 4.15 p.m. low continuous atmospherics were present, there being no break or intermission in them. They continued without any apparent change in character or strength until 5.40 p.m., when a slight increase in strength was noticed, and a gradual increase from thence onward until after dark, when they were fairly strong, and continued so for the rest of the evening. This, however, is the usual effect observed, atmospherics being very prevalent at this station.

No signals from the "Kildonan Castle" were received, and the ship reported hearing nothing from us until 6.25 p.m. The sun set with the shadow still upon it at 6.1 p.m.

The result, in my opinion, was distinctly negative, the more so as the low continuous atmospherics provided a most advantageous means of observing any variation that might have occurred.

Yours, etc.,
CHAS. NEATE.

Radio-Telegraph Station,
Durban,
*October 27th.*

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MARY SOMERVILLE.

SIR,—Just as the artist on viewing a picture can trace the influence of an old master, so in science we note where an inventor obtained his initiative. Thus in reading the admirable article on "Clerk Maxwell" in the November number of THE MARCONIGRAPH we find him taking up Michael Faraday's work. Then, going still further back, we find that prince of experimenters working very hard to demonstrate the identity of light with electricity; the keynote of which was struck by Mary Somerville in her paper on the magnetic properties of the violet ray in the solar spectrum given before the Royal Society in 1826. Indeed, wireless telegraphy owes another debt to that remarkable Scotch woman, for it was she that induced Adams to work out mathematically the perturbations of the planet Uranus, which led to him being the co-discoverer of Neptune. This was the direct cause of the Adams Prize Essay on the constitution of Saturn's rings, won by Clerk Maxwell in 1857. From the preparation of this essay Maxwell evolved his electro-magnetic theory of light, and laid the foundations of his mathematical deductions upon which Hertz founded his famous experiments resulting in the demonstration not only of the identity of light with electricity, but the Hertzian waves which give us wireless telegraphy.

Yours, etc.,
EDINBURGH.

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## Mr. Marconi.

AT the time of writing Mr. Marconi is staying at Venice with Mrs. Marconi, his secretary (Mr. M'Ewen), and some friends. The object of his visit to Venice was to have an artificial eye made and set. In the clinique at Turin, where he had his damaged eye removed, an artificial one was temporarily set. Inquiry was then made in different cities for a skilful maker and setter of artificial eyes, and the choice fell on Professor Luigo Rubbi, of Venice. A correspondent from Venice, writing in the *Scotsman* on November 19th, states that Professor Rubbi is a man of upwards of seventy years of age, who has a modest house and laboratory in a calle off Via XXII. Marzo. But he has remarkable ability in judging eye colour and in reproducing facsimiles of the eyes of patients. He produces not only the colour, but the minutest veins or streaks of colour in the eye. At first Professor Rubbi was asked to go to Turin, but he telegraphed that this was impossible, as at his age and in this weather he could not travel, nor could he guarantee any really good work to be done out of his laboratory, and so Mr. Marconi came here and put himself into his care. The artificial eye, of course, is not a globe, but only a thin convex sphere that is removable, just as false teeth are, and is removed every night. The proper adjustment of it is both a difficult and delicate work, and takes usually five or six days.

Mr. Marconi was on the way to America when the accident happened at Foce, near Spezzia. His automobile was going at a moderate speed, but the other that ran into his was going very fast. One cause of these motor-car accidents in Italy is that the drivers are very careless about keeping the rule of the road. They run all over the place. Indeed, both coachmen and chauffeurs act as if no rule of the road existed. Mr. Marconi says he did

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not suffer much pain at any time, and he always slept well.

Mr. Marconi is in the best of health and spirits, and says the marvel is that they were not all killed when the other machine mounted on the top of theirs. His cheerfulness is also explained by one fact that his left eye, the undamaged one, is in a perfectly sound condition, and there is no likelihood of its sight being at all affected by the removal of the right eye. Oculists state, according to the correspondent from whom we have quoted, that people can get on very well with one eye, so far as sight is concerned, and that the chief drawback of an artificial one is the contrast it must present with the living one (however much it may resemble it) in its lack of expression and its immovability.

On November 14th Mr. Marconi was present at the Rossini Theatre. As soon as his presence was observed the whole of those present rose and cheered, the ladies waving their handkerchiefs. Three times Mr. Marconi, who was greatly touched by the ovation, rose and bowed to the assembly. The Chamber of Commerce and the city authorities have sent him condolences and, at the same time, congratulations on the security of the sight of the left eye. They are naturally proud, too, that Mr. Marconi has been able to find a specialist in the making and setting of artificial eyes without going out of Italy, or away from Venice, with which city he has not a few associations.

## The Training of Operators.

THE scheme outlined in our November number for the establishment of evening classes at Marconi House, London, for training wireless operators has been carried a stage further, and the arrangements are so well advanced that applications will now be considered from suitable candidates. Applicants must be between the ages of 19 and 24 years, and need not have had any previous telegraphic experience, but it is essential that they should be good penmen. Young men desirous of undergoing a course of training which will prepare them for positions as wireless operators in the Marconi service on board ship should write to the Traffic Manager, Marconi House, Strand, London. Letters should be endorsed "Application Evening Classes," and should give particulars of previous business experience.

The committee of the Municipal School of Technology, Manchester, have under consideration the provision at the school of a commercial wireless telegraphy installation. Meanwhile it has been decided to organise a preliminary course in the subjects essential for those who wish to become wireless telegraphists. These subjects are: (1) Electricity as applied to wireless telegraphy; and (2) a knowledge of the Morse Code. To meet these requirements it is proposed to arrange suitable classes, meeting on two evenings during the session 1912–13. One evening will be devoted to a lecture, with tutorial work (from 7 to 8.30), and the second evening (from 7 to 9) to practical work. The latter will be arranged so that students will have the opportunity of practice in sending messages by the Morse key, and receiving by the use of the sounder or telephone. The inclusive fee for the course, including both classes, will be 30s.

## The Phillips Memorial.

THE committee appointed to make arrangements for the erection of a fitting memorial at Godalming to John George Phillips, the wireless operator on the "Titanic," have submitted their proposal to the Godalming Town Council. The scheme, which was drawn up by Miss Jekyll (the honorary secretary to the committee) in collaboration with Mr. Thackeray Turner, and which has been approved by the committee, takes the form of a rectangular cloister, with the further wall arcaded to lead out into a meadow beyond, and to bear a wide central panel where the memorial tablet will be placed. It is proposed also to utilise a site belonging to the town council for this purpose, and the authorities have given their full consent to the suggestion.

The cost of the scheme is estimated at about £700, and of this the actual sum received in subscriptions is £420, which includes about £100 collected by THE MARCONIGRAPH. As soon as plans showing the elevation of the building will be ready, the committee propose to issue a small sketch in the hopes that admiration of this beautiful structure will induce others to become subscribers. At the same time it should be pointed out that the scheme must not be regarded as a merely local affair; it is a national memorial to a national hero, and as such should command world-wide sympathy and support.

The Postal Telegraph Clerks' Association have intimated to the committee that they have raised a sum of £30, which they are prepared to add to the fund on condition that some small portion of the memorial can be identified with their association. To this the committee have already agreed, and a detail of the construction will be set apart to represent this special contribution. Further, at the next meeting of the town council a proposal will be brought forward that £100 be voted towards the fund, and it is not expected that there will be any opposition.

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# Unpublished Chapters from "The Sleeper Awakes."

FOOTSTEPS, at quiet, evenly-measured tread, could be heard approaching the room in which Graham sat, and almost as soon as he became aware of the sound the curtain slowly lifted. A tall, white-haired man, clad in garments of cream-coloured silk, appeared, regarding Graham from under his raised arm.

For a moment the white form remained holding the curtain, then dropped it and stood before it. Graham's first impression was of a very broad forehead, very pale-blue eyes, deep-sunken under white brows, an aquiline nose, and a heavily-lined resolute mouth. The folds of flesh over the eyes, the dropping of the corners of the mouth contradicted the upright bearing, and said the man was old.

### Ostrog

It was Ostrog, the prime mover of this great social upheaval which had shattered the power of the White Council, and had made of the spacious council hall a mass of crumbling, blackened masonry. Even now, as the two men faced each other, the noises of tumult could be heard coming up from the thronged streets. There were cries for the Sleeper, the Master, which kept rising and falling in waves of popular enthusiasm, and reached this lofty room in the Windvane Offices in a dull—almost imperceptible—hum.

Ostrog turned to Graham. "We thought you were killed," he said quietly, "and were preparing your 'double' so that the successful outcome of our enterprise might not have been altogether in vain. You are, you understand, our figurehead, for although your power is limited to a certain extent, all material wealth is yours. The capital that was invested for you three hundred years ago has accumulated to itself the entire resources of the world. You, therefore, stand as a symbol of all power and order. For over two centuries the people have been waiting for you to awake. You are to them the reincarnation of Barbaressa and King Arthur, and they see in your awakenment the commencement of a new era of emancipation—a Millennium, if you will. The Council looked forward with apprehension to this moment. They have cherished a hope that the occurrence which would undermine their authority and destroy their prestige was impossible. When, therefore, your long sleep was ended they were taken unawares, and there is no doubt that, had they been able to keep the secret of your awakenment dark, you would have been anæsthetised, and once more have been laid out on the marble slab in order that the old order of things might continue uninterrupted. But we had news of your approaching awakenment, and all our forces were drawn up, and our plans arranged against the event. We have won. To-night has been a night of victory. Everywhere your star has blazed. A day ago the White Council ruled, as it has ruled for a century and a half of years, and then, well, only a little whispering, a covered army here and there, suddenly—So!——" He broke off abruptly.

### The Camera Obscura

They listened to the noise without, then Ostrog stepped across the room, something clicked, and the place was in darkness save for an oval glow in the ceiling. As Graham watched it gradually cleared until at last he saw passing over the mirrored surface swarms and swarms of people travelling by the moving ways in every part of the city. They seemed to be concentrating in the squares, markets and theatres, which were already densely crowded. Gallery after gallery was packed with people. One particular space, in which a stage had been erected, was surrounded with a vast auditorium, and the black figures of the audience showed tier upon tier of densely-packed humanity. Graham realised that he was watching the events taking place in the city in a species of *camera obscura*, developed far beyond the limitations of such an instrument of his day. Soon Ostrog interrupted his reflections. "But there is work to be done, the people must be satisfied. They are clamouring to see you. And abroad they want to see you. Paris, New York, Chicago, Denver, Capri—thousands of cities are up in a tumult, undecided, and clamouring to see you. They have clamoured that you should be awakened for years, and now it is done they will scarcely believe——"

"But surely I can go?"

Ostrog answered from the other side of the room, and the picture on the oval disc paled and vanished as the light jerked back again. "There are kineto-telephotographs," he said. "As you bow to the people here, all over the world myriads of myriads of people, packed and still in darkened halls, will see you also.

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In black and white, of course—not like this. And you will hear their shouts reinforcing the shouting in the hall.

"And there is an optical contrivance we shall use," he added, "used by some of the posturers and women dancers. It may be novel to you. You stand in a very bright light, and they see not you but a magnified image of you thrown on a screen, so that even the furtherest man in the remotest gallery can, if he chooses, count your eyelashes."

Ostrog pulled back the curtain and motioned Graham to the door. As soon as they were outside he led the way and they entered a silently-gliding lift, and were swept down a fathomless distance, as it seemed to the unaccustomed occupant. Then a series of corridors and galleries were passed through until Graham, clothed in Imperial black, made his way into the vast arena he had seen in the oval mirror of the Windvane Offices. Together he and Ostrog mounted the stage, and were flooded with the brilliant light. For the minute he was dazed and troubled by the unaccustomed procedure, and then, remembering that he had a part to play in this drama, he made a violent effort to control himself. With all the composure which he could assume, he bowed on every side to the applauding multitude. Suddenly an idea struck him, and he reached out for Ostrog's hand and drew him forward a pace or two. The applause redoubled as they stood together—rescued and rescuer, the clear-headed Statesman and the bewildered Ruler of Mankind.

How little Graham at that moment suspected that within a short time Ostrog and he would be at death grips.

* * *

### The Beginning of the End

The end was in sight. But who would be victor in this titanic struggle? Certainly the odds lay with Ostrog—possessed of all the power of the latter-day knowledge, and able to direct the outcome of events by one touch on the complex keyboard of government. In his control were also the monoplanes, while to his keen insight and cold-blooded statescraft Graham's limited twentieth-century conceptions were as thistledown to the wind.

On the other hand, Graham was backed up by two great assets—fixity of purpose and the loyalty of the multitude, and, as he looked down from the aerial stage which surrounded his apartment in the Windvane Offices, and could see the multitudes engaged in vast preparations against the attack of the Ostrogites, he realised that this was no empty power.

His discovery of Ostrog's schemes and the consequent misery of the masses had come through Helen Wotton. She had urged him to use his eyes, and not be the puppet of his Ministers, and the earnestness of her tone had roused him to action. He half-wished that he had never followed her advice, for he scarcely dared to dwell on the scenes which he had witnessed in the underground factories of the metropolis—the sweated workers, the disease, and the terror, while his soul was sickened with the empty frivolity of the pleasure cities, and the perfumed strumpery which ended in euthanasia. He realised now that the rebellion against the White Council had been the popular expression of revolt against this system, and that his crafty Minister, Ostrog, had used this discontent to compass the downfall of the Government, and assume office by a clever *coup d'état*. But Ostrog had no wish to see the order of things changed. He could only countenance rebellion when it served his own ends; and once these had been gained the rebellion had to be ruthlessly crushed. But the storm once aroused could not be so easily dispelled. It had as its source the concentrated discontent of centuries, and the city, the nation, the world was seething with revolution. Poor, blinded, ignorant humanity! They scarcely knew what they were doing, or what they wanted. But he knew, Helen Wotton knew, a little band of chosen councillors also knew. They were the eyes and the ears and the brains of the populace. These blue-garmented myriads had hoped blindly in the awakenment of the Sleeper. The Sleeper was awake now. Their hope was near fulfilment. Already Ostrog had suffered severe losses. Many of the mechanics and military engineers had deserted from his ranks, and all he had to depend on were the hired black army and the combined fleet of aeroplanes. Nevertheless, unused as he was to modern tactics, Graham realised he was in a tight corner. Nothing could replace the want of aeroplanes. The deserters from Ostrog's army were hastily building others; but, despite the numbers of hands pressed into the service of construction, it would be many days before any could be completed, and as it was every moment was of importance. Already the black army, the hired assassins of Ostrog, were mobilised at Paris, New York and India, and the aeroplanes were speeding to headquarters from all parts of the world. Two aeroplanes constituted the whole of Graham's fleet; one had got out of the control of an unskilful aeronaut and had fallen in Hyde Park: it was badly damaged, but it was possible that within a few hours it could be repaired. The other was the special service 'plane which had been forgotten in the hasty flight of the Ostrogites, and was still standing ready for use on its aerial stage.

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Graham was glad he had been an aeronaut in the pre-somnian days, for he knew that the forthcoming battle would be fought, if not by aeroplanes, at least through their agency, for all the success or failure of tactical manœuvres would depend on aeroplane observation. He realised how important was this single car, and resolved to control it himself. So bent was he on his purpose that he had risen with an idea of inspecting the machine before he was aware of anyone in the room.

**Phryths**

It was the Windvane keeper, to report that the entire telegraphic staff had declared for his service. Already the wireless operators were tapping the communications of the enemy, and had been able to hamper the organisation of their forces by sending false messages. "Phryths, the commandant of the wireless corps," he concluded, "was waiting outside; would The Master be pleased to see him, as he had important plans to discuss?"

Graham signed to him to enter, and was confronted with a little man who bore unmistakable signs of Japanese descent. He was clean shaven, and his face was bloodless and scarred, the skin was wrinkled round the eyes and stretched tight across the nose and the high cheek-bones. His wiry, iron-grey hair was plastered down on either side of a high but narrow forehead. As he waited for a word from Graham he nervously fidgetted the quicks of his finger nails, and his action showed square, sinewy and capable hands.

"You want to see me about some plans?"

"Yes, sire."

"Can you give me the main details now? There is much to do, and even as it is we cannot help the enemy finding us unprepared."

At these words Phryths came closer and began in a slow, hushed tone to unfold a plan for the discomfiture of Ostrog's host. As his discourse proceeded he spoke faster and faster, until it ended in a hurricane of excited words.

"The detonators have already been manufactured, and to them we have fixed a kind of tuning-fork, the whole apparatus weighing scarcely two pounds. If only a 'plane can be perfected before the fleet starts from Paris, we are certain of success. Our only hope is that Ostrog will remain in hiding in the city some little time longer. Once he joins the fleet in Paris the whole invading force will be put in motion, and we are doomed. All depends on our securing an aeroplane—and an aeronaut—first."

**The Game's Afoot!**

Graham motioned him to the window, and showed him the special service aeroplane on its stage. "Go," he said to Phryths, "and bring me the bombs. If it is possible they shall be placed to-night." He rang a bell on the table, and demanded an organicist. When that functionary appeared he asked him if there were any means of anestheticising an adversary; he wanted something that would take effect instantaneously; something that could be sprayed into the atmosphere, but at the same time he desired immunity from its effects for himself. The organicist was doubtful, but he would see what could be done; and with a deep obeisance he hurried out, and was lost to sight on a moving way.

Graham saw his way more clearly now. Only the destruction of that aerial fleet stationed at Paris could save his people. He would be the destroyer, or at any rate make this attempt to emancipate them. He rang the bell again.

He told the attendant to bring Helen Wotton to him, and while he waited he looked out from his window in this Teufelsdochel Tower. The sun was just sinking, already the seven larger units of Ursa Major were visible in the blue expanse, deep as lapis lazuli. The last glow of light fell on the distant Surrey hills, over Richmond way a thick mist was rising, and just beneath him was the great glowing globe of the hemispherical roof which shut in the eight and twaindy myriads of his subjects . . .

The curtain rose and fell—Helen Wotton was in the room. He advanced to her, and immediately she ran forward and grasped his hands. "Sire," she whispered in a voice strained with excitement, "the South-West Wards are marching to help in the defence of the city. The volunteers have mounted every available gun, and each point of vantage is defended."

Graham smiled at her enthusiasm. It was all so splendidly illogical. A few bombs dropped by a score or so of invading 'planists and all this work would be wasted. Yet at this moment there was a fleet a thousand strong ready to swarm down on the insecure capital: 300 lying ready to sail at Paris, 400 at New York, and another 400 mobilising at Delhi. But no nature is proof against the glow of zeal; his excitement grew as the story of defence preparations proceeded, and soon he found himself incoherently explaining his plan of action to her.

"But, sire," she cried, "where is the aeronaut?"

"Here."

"And the wireless operators?"

"They are on our side; one must come with me." He rang the bell.

"Tell them to put the special service aeroplane on the guides." The attendant had

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scarcely disappeared before Phryths entered to report that the bombs were ready.

Graham and Helen followed him into his special wireless cabin in the round tower where he had caused the bombs to be stored. In curt phrases he explained the mechanism of the apparatus attached to them, and suggested a way of secreting them in the cabin of the 'planes. Graham grasped the necessary details with a keenness which was intensified by mental excitement. Every step of his proposed action was clearly defined in his mind. He recollected he still wanted some means for subduing the sentinels, and inquired again for the organicist.

Within a few minutes he appeared carrying in his hand a small puff-ball. He explained that the instrument was used in extreme cases in the Euthanasia. A pressure on the indiarubber ball would release a fine glittering powder which would produce instant insensibility and ultimate death ; at the same time he handed him a mask of the appearance of gold-beater skin which would cover the nostrils and mouth, and filter the air of the noxious atoms.

Graham took the instrument, and the organicist disappeared ; then he directed Phryths to have the bombs conveyed to the 'plane's cabin. The commandant hurried away to make the necessary arrangements, the door banged, and he and Helen were left alone.

At that moment Graham felt as if they were isolated from the current of events. In a world of activity they had stumbled on a dream. Outside was the tumult, the stupendous realisation of a world struggle between Ostrog and himself, and then this confined, quiet little room with its brass keys and blank white indicators and knobs and wires ! They were no longer persons, but mere spectators, mere impressions of a tremendous convulsion. They became unreal even to themselves, miniatures of personality indescribably small ; and the two antagonistic realities, the only realities in being, were first the city, that throbbed and roared yonder in a belated frenzy of defence ; and secondly, the aeroplanes waiting to whirr up like a covey of partridges and appear over the round shoulder of the world.

**Graham Sets Out**

There came sounds of a louder commotion from outside, a running to and fro, and cries. A clock thrumming in Graham's brain told him it was time for him to take his departure. He grasped Helen almost roughly by the shoulders, then let her go and turned to open the door. Immediately as he did so Helen cried out :

" What do you mean to do ? "

" This special service 'plane—it is a chance——"

" You don't mean——"

" To try—yes. To break up the fleet. I have thought it out. We have only one aeroplane, but there is the wireless to be used. A resolute man ! I see now something to do. I see now why I am here ! "

Helen made a step towards Graham. Her face was white. " But, sire ! How can you succeed ? You will be killed."

" Perhaps. Yet not to do it, or let someone else attempt it——"

" You will be killed," she repeated.

" I've said my word. Do you not see ? It may save—London ! "

He stopped, he could say no more ; he swept the alternative aside by a gesture, and they stood looking at one another.

They were both clear that he must go. There was no step back from these towering heroisms.

Her eyes brimmed with tears. She came towards him with a curious movement of her hands, as though she felt her way and could not see ; she seized his hand and kissed it.

" To wake," she cried, " for this ! "

He held her clumsily for a moment, and kissed the hair of her bowed head, then thrust her away. Then he stepped out into the blinding light.

He could not speak to the attendant who was waiting for him ; but the gesture of his arm said, " Onward."

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As an instance of the great value of wireless telegraphy to the cargo steamer, we quote you the following extract from a letter received by the owners from the captain of the s.s. " Drumcraig," which left Liverpool on September 28th, and arrived in Galveston on October 16th. The captain writes as follows :

> " During the passage I have had more than one inquiry from other vessels as to the state of the weather at my point, the others, of course, giving me their own present conditions, which it is often very useful to learn. But by far the most useful were the reports which I received from the American coast stations during the last few days, and you will understand the relief it was to learn definitely by that means that the hurricane (whose course I was striving to determine without, perhaps needlessly, delaying my voyage) was inclining just sufficiently to the westward to carry its dangerous centre about clear of us."

Obviously, as more ships become fitted the more information will be available, and in times like the present, where delay means such serious loss of profit, wireless telegraphy might often be of the greatest value.

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## Technical Notes

SPARK-GAP OSCILLATIONS.—In the interesting paper from Dr. W. H. Eccles and Mr. A. J. Makower, which we reproduce on pages 368-70, the authors do not appear to claim that the results so far obtained are of much practical value with regard, at any rate, to commercial wireless. With water, the low efficiency, when the flow is rapid, would seem to put the method described out of the running, except as a laboratory method for obtaining steady oscillations for quantitative experiments. On the other hand, when the efficiency is improved by decreasing the rate of flow, the method would apparently have to be complicated by the introduction of automatic means of "feeding" the electrodes, a process which is rendered the more difficult by the fact that these have to pass through stuffing-boxes.

Turning to the experiments in which oil is substituted for water, one advantage suggested over the ordinary air-gap is that the oil-gap, being enclosed, eliminates the "deafening noise" associated with the air-gap. We think that the authors are over-estimating the importance of this point. There are many ways in which the noise of a half-kilowatt spark (which is the greatest power mentioned in these experiments) can be reduced to a negligible sound, simpler than a method necessitating a constant stream of oil, which requires filtering from time to time.

But experiments like these, conducted in such a scientific manner and spirit, are (to use a word constantly applied to Mr. H. G. Wells' works) "provocative," and the more of them that are carried out, and the more they are made public, the better for the progress of the science. It would be interesting to know how these methods would behave when applied to higher powers, where so many excellent laboratory results behave in an unreasonable and disappointing manner.

* * *

CONDENSERS FOR WIRELESS TELEGRAPHY.—In a study of the various type of condensers used in wireless telegraphy which recently appeared in the *Electrician*, Mr. W. Torikata and Mr. E. Yokoyama deduce the following general conclusions: The surface, as well as the edges of the metal coating of the condensers, must be very smooth; the smoothness is far more important than the nature of the metal itself in decreasing the total losses of the condenser; the total length of the edges of the metal coating must be as short as possible (from this point of view it is concluded that the Leyden jar type of condenser is better than the plate type); the enamel process is very efficient, and practically annuls brush discharges; also it shows no difference between the various types of condensers in regard to brush discharge.

* * *

ELECTROMAGNETIC AND LIGHT-WAVES.—The radiation in wireless telegraphy is similar to light; therefore it is of interest to refer to a comparison of the human receiver of this radiation—namely, the eye, with the receiver of a wireless station, made by Mr. W. Duddell before the Institution of Electrical Engineers. According to some recent experiments by Messrs. Paterson and Dudding a light of $\frac{1}{10}$ of a candle at a distance of a kilometre is near the limit of visibility. Assuming the square law this corresponds to a candle-power of 2,560 at 100 miles. With our present incandescent lamps this would require 2½ kw. In wireless, to cover the same distance, it is usual to instal what is nominally a 1½-kw. station. Taking, however, Drysdale's figures for the rate of radiation of energy in the visible spectrum (about 0·1 watt per candle-power), our source of light is radiating energy at the rate of about 250 watts. Assuming the overall efficiency of wireless antenna at 20 per cent., the radiation of the wireless antenna is 300 watts. It would seem, therefore, that there is a remarkable similarity between the sensibility of our eye to radiation of the short wave-length which constitutes light, and the sensibility of our wireless receiving apparatus for the long wave-length radiation used in telegraphy. According to Lord Rayleigh's experiments, if a tuning-fork is producing sound at the rate of 42 ergs per second it will just be audible at a distance of 30 yards. This corresponds to a source of sound giving out 0·0056 watts being audible at 1 km., or assuming no absorption or bending of the sound waves 143 watts at 100 miles. We, therefore, have the curious result that if it were possible to radiate energy at a given rate, either as sound-waves or as light-waves or as long Hertzian waves, we should be able to detect them at approximately the same distance by means of our ear or our eye or the receiving apparatus of a wireless station. Wireless time signals are regularly sent out each day for the use of the ships at sea. In view of the fact that wireless signals are received practically simultaneously everywhere on the globe, they form in conjunction with transit observations a ready means for the determination of differences of longitude to a high degree of accuracy. It is claimed that in recent tests differences of time were determined to an accuracy of $\frac{1}{100}$ of a second, which corresponds to an uncertainty in position of only 5 yards at the Equator. The surveying of difficult country may be expected to be greatly facilitated by this new means of determining the difference of time,

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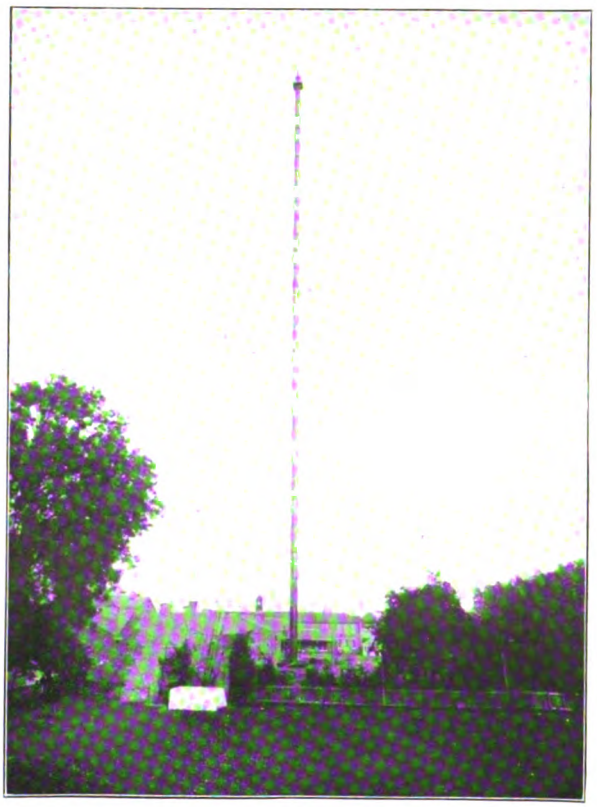
## The Physiological Effect of Hertzian Waves.

THE physician in the French Navy whose investigations have led him to conclude that Hertzian waves as used in wireless telegraphy do definite physical injuries to those who come into their vicinity has against him the main current of experience and science. No protection of any special kind, either for the eye or the exposed parts of the body, is provided for, or demanded by, wireless operators. The notion that a wireless telegraph operator can have his health injured by the use of the electrical apparatus is based on some confusion between Hertzian waves and Röntgen rays. Now, it must be clearly and primarily understood that Röntgen rays, X rays, and so on, have nothing whatever in common with Hertzian waves. Röntgen and X rays do have a powerful physiological effect, and they are utilised on that very account. But Hertzian waves cannot be legitimately supposed to have any effect on the organism at all.

The idea that ultra-violet or other troublesome rays come from the arc used in wireless telegraphy is quite absurd, for the simple reason that the arc is enclosed. Thus the wireless operator is not affected by the arc in any degree, and so he is no more affected by the Hertzian waves than other persons in different parts of the body of the ship. Unfortunately everything electrical has to run the gauntlet of prejudice, and this attack on the hygienic properties of wireless telegraphy is easily paralleled by other attacks. Wherever the source of some conflagration is doubtful the fusion of electric light wires is given the discredit. Again, electric incandescent light is accused of injuring the eyesight, whereas it gives practically the same kind of light as incandescent gas burners. Generally speaking, the comparative novelty and apparent mystery of things electrical call out the instincts of opposition and scaremongering. We suppose that the electrical industry will be open to this kind of opposition until something newer and more astounding and more useful to man is discovered.



*One of the 450 feet Masts erected at the Marconi Works, Chelmsford.*

## Exploring the Earth's Interior.

SOME months ago we referred to some experiments which were made towards exploring the interior of the earth by means of electric waves. The matter has since occupied a good deal of attention, notably from Mr. E. Kilburn Scott. In the course of a paper before a London meeting of the Association of Mining Electrical Engineers, Mr. Scott referred to the future possibilities of firing mine and quarry explosives by "wireless" methods, thus making for the greater safety of those who are conducting the operation. Shot-firing is a risky business at the best of times, and the farther one can get from the actual centre of the explosion the better one is situated to avoid accident. The adoption of wireless principles for this duty would, of course, extend the possible range of the firing point almost indefinitely. "He would be an unwise man," remarked Mr. Scott, "who said this would never be done"; but, of course, lots of things are possible which are not commercial.

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## Reviews of Books

"Wireless Telegraphy, and How to Make the Apparatus." ("Work" Handbooks, 1s. net.)

The "electrical amateur" to whom this up-to-date and practical little book is addressed should have no difficulty, if he has a very average collection of tools and the power to borrow the occasional use of a lathe, in obtaining the results indicated. Indeed, we think that at times the author is even inclined to overestimate difficulties; as, for instance, when he states that with an ignition coil giving an eighth of an inch spark the signalling distance, using the receivers described, would only be a few yards. The least satisfactory chapter is perhaps the first, where the author deals with theory rather than with practice. In striving, for instance, to give a clear idea of the functions of the ether, he states that it conducts light, heat and *sound* by means of etheric waves (page 2). We were about to commend the wise warning on page 13 against the uses of gas-pipes as transmitting earth-leads, when we noticed that on page 59 it is very inconsistently stated that a gas-pipe may be used for this very purpose. In the matter of a wave-meter, whose use adds so much to the instructiveness of "tuning" experiments, it seems a pity to risk deterring the amateur from its manufacture by saying that it must of necessity be calibrated in a laboratory. It should be possible, by using "plain aerials" of various known lengths, to calibrate the home-made wave-meter at home in a way instructive and sufficiently accurate. These are small defects which might be remedied in a further edition, which would seem likely to be called for.

"Universities and National Life," by Viscount Haldane. (John Murray, 2s. 6d. net.)

The fact that this volume of Lord Haldane's addresses has now reached a 4th edition is ample testimony to the wide appreciation it has received. But these essays are not light reading. They probe too deeply into the great "How's" and "Why's" of our existence, both as individuals and as citizens, to be easy of understanding. But they are earnest reading, fascinating reading, if you will, for they make a direct appeal to the intelligence and sympathy of the reader by their ingenuousness and sincerity of tone.

The four addresses are severally entitled: (1) The Soul of a People; (2) The Calling of a Preacher; (3) The Dedicated Life; (4) Great Britain and Germany; a Study in National Characteristics.

In the first three Lord Haldane shows himself a "practical idealist"—that is to say, he is a man who appreciates a practical nature, but is not blind to the fact that such a nature, to be completely developed, must have a certain amount of idealism as a component part. What is perhaps even better, he preaches the need for idealism as the motive force of all action, and points out that, without it, the loftiness of purpose which distinguishes the work of any truly great citizen will be wanting.

From time to time in his discourse Lord Haldane illustrates his remarks with a graphic word-sketch of some notable man, and notable amongst these is his portrait in "The Soul of the People" of Hermann Lotze, the man and the philosopher. But perhaps the most interesting is the address delivered at Oxford in August, 1911, on "Great Britain and Germany." In it a difficult subject is handled in a masterly way, and it shows an intimate knowledge of German literature and social life. Lord Haldane briefly reviews the evolution of German philosophy in order to show how it is that the Germans became possessed of "habits of thinking in abstract terms, even when dealing with the most immediate and practical affairs, and of looking for principles everywhere, which make things at times trying for those who have not this useful if difficult habit of mind in the same degree." Later, he sums up the English characteristics in an equally admirable phrase: "What we have actually done, we have done—not as the outcome of any pre-conceived and thought-out policy, but because . . . at the moment it was the obvious thing to do . . ." and so he drives home his point—"What is wanted then is education in mutual understanding." But it is impossible to do full justice to the book in a short review. "Universities and National Life" is a book to be read, and re-read, and pondered over.

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We have received a copy of the paper presented before the Institution of Electrical Engineers by Dr. J. A. Fleming, F.R.S., and Mr. G. B. Dyke, B.Sc., on "The Power Factor and Conductivity of Dielectrics when Tested with Alternating Electric Currents of Telephonic Frequency at Various Temperatures." This paper, which is reprinted from the *Journal* of the Institution, is a valuable addition to the literature dealing with the subject. The authors concern themselves with only one department—viz., the power factor and conductance of dielectrics under alternating electromotive force of low voltage, pure sine wave-form, and of frequencies of 900 and 5,000 p.p.s., as this has a close connection with practical telephony.

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## Recent Marconi Orders

Nine 3-kw. motor-car stations have recently been ordered by the Italian Government from Marconi's Wireless Telegraph Co., Ltd.

The following steam yachts have been equipped with Marconi apparatus :

The " Valiant," the property of Lord Pirrie.

The " Doris," the property of S. Joel, Esq.

Orders have been received to equip the following vessels :

Fifty vessels of the Ellerman Line.

Three submarines of the Brazilian Government.

Six White Star Line vessels.

Five Dominion Line vessels.

The following vessels have been equipped with Marconi installations during the past month :

| Owners. | Name of Vessel. | Installation. | Service. |
|---|---|---|---|
| Andrew Weir & Co. ... | s.s. " Luceric " ... | 1½ kw. | Cargo transport between Savannah and Liverpool |
| ,, ,, ,, ... | s.s. " Poleric " ... | 1½ kw. | Cargo transport between Africa and India |
| Bucknall Steamship Co. ... | s.s. " Johannesburg " | 1½ kw. | Cargo vessel with world-wide service |
| ,, ,, ,, ... | s.s. " Kentucky " ... | 1½ kw. and emergency set | Cargo vessel |
| J. Chadwick & Sons ... | s.s. " Drumcree " ... | 1½ kw. | Cargo vessel between Liverpool and Buenos Ayres |
| ,, ,, ,, ... | s.s. " Drumlanrig " | 1½ kw. | Cargo vessel between Liverpool and Buenos Aires. |
| Cunard Mail Steamship Co. | s.s. " Ultonia " ... | 1½ kw. | Passenger between New York and Mediterranean |
| T. and J. Harrison ... ... | s.s. " Wayfarer " ... | 1½ kw. | Passenger, cargo between Liverpool and New Orleans |
| ,, ,, ,, ... | s.s. " Custodian " ... | 1½ kw. | Passenger, cargo between Liverpool and New Orleans |
| Messrs. Lage... ... ... | s.s. " Itapuhy " ... | 1½ kw. | Cargo vessel in South American waters |
| Lamport & Holt ... ... | s.s. " Veronese " ... | 1½ kw. | Cargo vessel |
| P. & O. Steam Navigation Co. | s.s. " Sicilia " ... | 1½ kw. | Passenger between London and Japan |
| ,, ,, ,, | s.s. " Palawan " ... | 1½ kw. | Passenger between London and Calcutta |
| ,, ,, ,, | s.s. " Sunda " ... | 1½ kw. | Passenger between London and Japan |
| ,, ,, ,, | s.s. " Nubia " ... | 1½ kw. | Passenger between London and Calcutta |
| ,, ,, ,, | s.s. " Sardinia " ... | 1½ kw. | Passenger between London and Japan |
| Royal Mail Steam Packet Co. | s.s. " Magdalena "... | Emergency apparatus | Passenger, Southampton to New York via West Indies |
| ,, ,, ,, | s.s. " Tagus " ... | Emergency apparatus | Passenger, Southampton to New York via West Indies |
| Union Castle Steamship Co. | s.s. " Berwick Castle " | 1½ kw. | Passenger between London and Mauritius |
| ,, ,, ,, | s.s. " Cawdor Castle " | 1½ kw. | Passenger between London and Mauritius |
| White Star Line ... ... | s.s. " Delphic " ... | 1½ kw. | Passenger, destination uncertain |
| Yeoward Bros. ... ... | s.s. " Aguila " ... | 1½ kw. | Passenger between Liverpool and Canary Islands |

Orders have been received by the Marconi Co., Ltd., to equip the following vessels with wireless installations :

| Owners. | Name of Vessel. | Service. |
|---|---|---|
| Andrew, Weir & Co. ... | s.s. " Suveric " : ... ... ... | Cargo, transport between Africa and India |
| ,, ,, ,, ... | s.s. " Kumeric " ... ... ... | Cargo, transport between Africa and India |
| ,, ,, ,, ... | s.s. " Orteric " ... ... ... | Cargo, transport between Africa and India |
| ,, ,, ,, ... | s.s. " Salamis " ... ... ... | Cargo, transport between Africa and India |
| ,, ,, ,, ... | s.s. " Roseric " ... ... ... | Cargo, transport, destination uncertain |
| ,, ,, ,, ... | s.s. " Naueric " ... ... ... | Cargo transport between Africa and India |
| Burns, Philip & Co. ... | s.s. " Matunga " ... ... ... | Building |
| Lulea Ofoten ... ... | s.s. " Murjek " ... ... ... | Building in Thompson's yard, Sunderland |
| Fraissinet et Cie ... ... | s.s. " Corte II." ... ... ... | — |
| ,, ,, ... ... | s.s. " Golo " ... ... ... | — |
| ,, ,, ... ... | s.s. " Liamone " ... ... ... | — |
| ,, ,, ... ... | s.s. " Iberia " ... ... ... | — |
| ,, ,, ... ... | s.s. " Corsica " ... ... ... | — |
| ,, ,, ... ... | s.s. " Numidia " ... ... ... | — |
| ,, ,, ... ... | s.s. " Italia " ... ... ... | — |
| R. Paquet et Cie ... ... | s.s. " Doukkala " ... ... ... | — |
| S. Pearson & Sons ... ... | s.s. " San Bernardo " ... ... | Passenger, destination uncertain |
| P. & O. Steam Navigation Co. | s.s. " Borneo " ... ... ... | Passenger between London and Calcutta |

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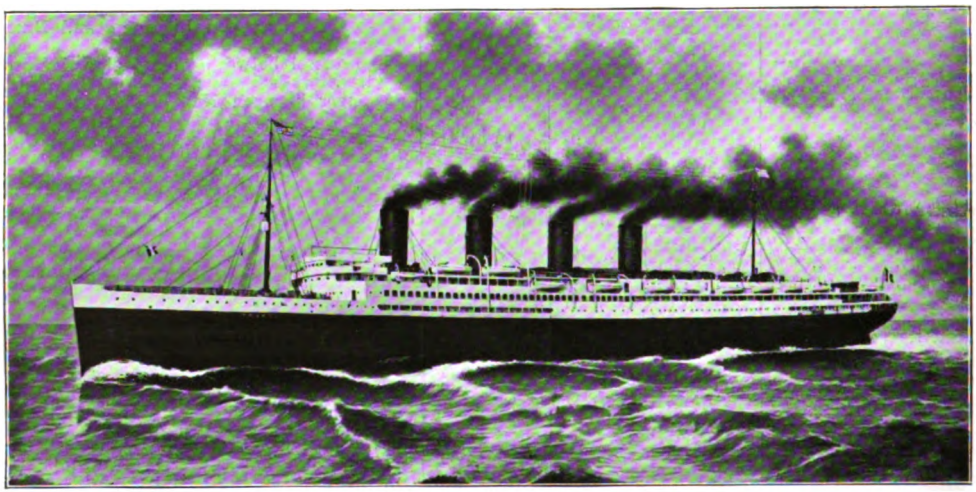
# Maritime Wireless Telegraphy

THE accompanying illustration is that of one of the leading French mail steamers—"France"—which has recently been added to the fleet of the Compagnie Générale Transatlantique. This superb vessel compares favourably with the modern leviathans which cross the Atlantic, and it is a tribute to the progress which the Marconi system has made in France that the vessels of this great maritime company should be equipped with the Marconi apparatus. The



*The s.s. "France"*

installation is a standard 1½-kw. set, and it has been carried out by the Compagnie Française Maritime et Coloniale de Télégraphie Sans Fil à Paris. It is capable of receiving long-distance messages from Poldhu (England) and Cape Cod (United States), and by that means the "France" is capable of publishing a daily newspaper on board—the *Journal de l'Atlantique*. The "France" is 220 metres in length and has accommodation on board for 1,925 passengers and a ship's company of 560.

✦

The s.s. "Pontianak," a cargo boat of the Rotterdam Lloyd, after having left Makasar for Soerabaja, ran on a rock near the Kangean Isles on the following day, and sprang a leak, by which the fore-holds became full of water. The "Pontianak" informed the station at Sitobondo of the accident by means of wireless. Before aid came the ship had come off again without assistance, and continued the voyage to Soerabaja, where she arrived the day after.

✦

The Canadian Northern liner "Royal George," bound from Avonmouth to Quebec, ran ashore in a dangerous position on the Beaumont Shoal at the western end of the Isle of Orleans, about 10 miles due east of Quebec on November 7th. No lives were lost.

Wireless messages were despatched to Quebec, and tugs and other river craft were quickly on the way to the rescue, but the fog began to thicken, and it being low tide, it was some time before the rescuers could get near the liner. However, the transhipment of the passengers was proceeded with quickly, but in orderly manner, and 420 were transferred to a ferry boat by midnight. In the darkness the craft was very nearly wrecked on the same ridge, but good seamanship prevailed, and the rescued people were safely conveyed to Quebec.

✦

A severe hurricane almost destroyed the seaport of Acapulco, Mexico, recently, and information concerning the disaster was made known through the medium of wireless telegraphy.

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The announcement in the *Daily Telegraph* that six men were dying of hunger in the lighthouse on the Island of Loveira is an unwelcome reminder of the extraordinarily large field there is still open for wireless. The poor men were without any communication with the mainland for thirty days, and naturally great anxiety prevailed regarding their terrible situation. Loveira is an islet off the coast of Corcubion in Spain, and is not very far from Cape Finisterre, near which the "Delhi" came to grief some time ago. Although a number of lighthouses are already equipped with wireless apparatus, it cannot be said that the number is by any means adequate, and we hope that the authorities controlling lighthouses in different parts of the world will give the matter their serious attention. In this way they will be increasing the efficiency of the lighthouses and, at the same time, render their occupants more immune from the dangers of the ocean.

Upon arrival of the Union Steamship Company's s.s. "Tofua" at Levuka it was learned that cable communication between Levuka and Suva had been interrupted by storms and floods for several days. Consequently business men at Levuka suffered great inconvenience and probable loss through being isolated from other parts of the world.

When the postmaster at Levuka learned that the "Tofua" was equipped with Marconi apparatus, he requested the Marconi operator on board to communicate with the Marconi station at Suva, and to transmit and receive from Suva by wireless the large number of cablegrams which had accumulated, and were being delayed at both ends of the broken cable.

Throughout the "Tofua's" stay in the port, the Marconi operator was kept busy with messages to and from Levuka and the outside world. All messages dealt with by this means were received quickly and accurately. Although the "Tofua" could stay but a few hours in the port, her Marconi installation during that time proved of great service and value to the traders on the island.

The s.s. "Huanchaco" arrived at Punta Arenas on November 21st with a number of the passengers of the Pacific Steam Navigation Company's steamer "Oravia," which was wrecked off the Falkland Islands on November 12th. It appears that the vessel struck a rock half a mile from the lighthouse at the entrance to Port Stanley at ten o'clock at night. Blinding snow and intense darkness made it impossible to see anything. The wireless apparatus proved the salvation of those on board, for in response to the signals of distress five whale boats arrived three hours after the ship struck. The mails and baggage were also saved, but the cargo was lost, as the "Oravia" broke in two and sank. There was no loss of life.

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The new rates for wireless telegraph messages off the Canadian coast become effective on December 1st.

The Telegraph Master, Karachi, notifies that the new Karachi Wireless Telegraph Office has now been opened, and is available for the transmission of public wireless telegrams to all ships fitted with wireless installations.

The regulations which are to govern the free import of shipbuilding materials have at length been drawn up by Mr. McVeagh, Secretary to the Treasury of the United States, and will shortly be promulgated. They provide for the free entry of wireless telegraphy apparatus, and of sails and rigging as part of the equipment of a ship.

A Spanish Royal decree has lately been promulgated making obligatory the installation of wireless telegraph apparatus on Spanish passenger steamers. Following is a summary of the decree:

1. From August 1st, 1912, all Spanish merchant vessels which carry passengers or mails shall be fitted with wireless apparatus.

2. The apparatus must be in accordance with the requirements of the Ministry of the Interior and of the General Direction of Posts and Telegraphs.

3. Shipping companies shall, as soon as the installation has been completed, communicate this fact to the competent authorities in order that such installation may be submitted to official tests.

A further Bill is also before the Cortes dealing with the same subject. This reads:

"Commencing from January 1st, 1913, no passenger shall embark in Spanish ports on any ship which has not been provided with wireless apparatus, the marine authorities only granting the necessary authorisation after ascertaining that the apparatus in question is in good working order."

It will be observed that, although the decree deals with Spanish shipping only, the Bill seeks to make obligatory the installation of wireless telegraphy on the vessels of all nationalities embarking passengers in Spanish ports.

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## Two Centuries Ago.

THE following curiosity of literature extracted from the *Spectator* of two hundred years ago—viz., December 6th, 1711,—heralds the idea of wireless telegraphy:—

"Strada, in one of his prolusions, gives an account of a chimerical correspondence between two friends by the help of a certain loadstone, which had such virtue in it that if it touched two several needles, when one of the needles so touched began to move, the other, though at never so great a distance, moved at the same time, and in the same manner. He tells us that the two friends, each of them possessed of one of these needles, made a kind of a dial-plate, inscribing it with the four-and-twenty letters, in the same manner as the hours of the day are marked upon our ordinary dial-plate. They then fixed one of the needles on each of these plates in such a manner that it could move round without impediment, so as to touch any of the four-and-twenty letters.

"Upon their separating from one another into distant countries they agreed to withdraw themselves punctually into their closets at a certain hour of the day, and to converse with one another by means of this their invention. Accordingly, when they were some hundred miles asunder, each of them shut himself up in his closet at the time appointed, and immediately cast his eye upon his dial-plate. If he had a mind to write anything to his friend, he directed his needle to every letter that formed the words which he had occasion for, making a little pause at the end of every word or sentence, to avoid confusion. The friend, in the meanwhile, saw his own sympathetic needle moving of itself to every letter which that of his correspondent pointed at.

"By this means they talked together across a whole continent, and conveyed their thoughts to one another in an instant over cities or mountains, seas, or deserts."

## Falkland Islands.

Six thousand five hundred square miles, chiefly of bog-land, pasture, and morass, cut through by brownish tarns; a bleak climate like most of the outer Hebrides, rain on 250 days in the year, leaden skies nearly always, a little capital called Stanley with some 600 inhabitants and three places of worship, these are the lot of the electrical engineering staff who man the new 5-kw. Marconi station at the Falkland Islands, described in a recent issue of this journal. The Crown Agents for the Colonies gave out the order, and some importance attaches to this new move, as the radius will cover a distance in which navigation was much at a loss for means of communication. We hope to say more about this on a future occasion.

## A New Limb of the Law.

A sensational use of wireless telegraphy has been made in tracing the whereabouts of Nestor Wilmart. Wilmart is a Belgian millionaire, who, after leading a life of affluence and good repute and making a name for himself on the racecourse as owner of a magnificent stud, was suddenly seen no more either amongst his wide circle of friends or in his accustomed resorts. His disappearance elicited inquiries, with the result that he is alleged to have forged railway share certificates to the tune of over two million pounds which he had deposited at various banks as security for substantial loans. Upon this discovery followed an easily understood desire to find the whereabouts of Nestor Wilmart. Detectives searched, but in vain. Paris and London were vigorously scoured, but all to no purpose, and the authorities were nonplussed. One evening, however, a wireless message was received by the judicial authorities at Brussels from the captain of the "Etoile Belge," a steamer belonging to the General Atlantic Company, then on its way to New York, stating that Nestor Wilmart was on board the vessel. A wireless reply was immediately forwarded to the "Etoile Belge" ordering a special watch to be kept on Wilmart, and at the same time an order for his arrest was sent to the authorities at New York. Nestor Wilmart is now on his way back to Belgium. We should rather like to know his opinion of wireless telegraphy.

* * *

Another arrest was recently effected by means of wireless telegraphy. Rode Ballagon was "wanted" by the authorities at Harrisburg, and it was believed he had booked a passage on the steamship "Haverford," which was due to start for England from Philadelphia. Detectives were immediately dispatched, but failed to find their man on the ship. They, however, learned that the steamer "Graf Waldersee" had just started from Philadelphia, and would probably have Ballagon aboard. They therefore communicated through the "Haverford" with Detective Cameron as to the best course to pursue. The reply came back: "Charter tug, endeavour overtake 'Graf Waldersee.'" The advice was acted upon, and the liner was overtaken at League Island. The detective's surmise was found to be correct, but definite orders were necessary before they could carry out the arrest.

Following the captain's suggestion, a message was quickly transmitted to a wireless receiving station on top of a building near City Hall and delivered to Captain Cameron, who, in replying, instructed the detectives to arrest Ballagon.

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# A Cruise in Troubled Waters

FOR a man who has not yet completed a third part of man's allotted period on this planet, Mr. Ernest R. Sprice, the wireless operator on board the s.s. "Montevideo," has had a life singularly full of incident. He was educated at Battersea Grammar School, and received his wireless training at the Clapham School of Telegraphy. From there he entered the service of the Compagnie de Télégraphie sans Fil, and later was transferred into the Compagnia Transatlantica Español.

His latest experience has been the Mexican Rebellion in Vera Cruz, and he has written home a graphic account of the incidents of the bombardment of Vera Cruz, and of the service which wireless rendered in enabling his ship to go to the rescue of many starving refugees.

When the "Montevideo" arrived at Habana from New York, news was received from the agent that trouble was brewing at Vera Cruz, and after many telegrams had been exchanged with the authorities regarding the best course to pursue, it was at last decided that the vessel should go to Porto Mexico, and not risk the dangers of attempting a landing in the danger zone. Accordingly, the "Montevideo" started from Habana on October 19th, and on the following day information was obtained that the rebels held Vera Cruz, all communication with the capital had been cut off, and business was at a standstill. This news was reported to the captain, who was immediately anxious to have information regarding the state of affairs at Porto Mexico, for if the position of affairs were the same at this port it might be impossible to effect a landing. Such information was, however, not forthcoming, the only definite news being received from the wireless station at Campeche. And this was news of a negative description, for the operator told the "Montevideo" that communication had been cut off for five days, and he had heard nothing further. The captain decided to proceed and take his chances, and on the morning of the 22nd the "Montevideo" arrived at Porto Mexico and found all quiet. But a message was awaiting her from the Spanish Consul giving instructions to the captain to proceed at once to Vera Cruz, and take off all Spanish residents, as an official intimation had been given by the rebels that the town was shortly to be bombarded.

*Mr. E. R. Sprice.*

The captain immediately informed the passengers that, as the "Montevideo" had been commissioned for Vera Cruz on special service, disembarkation was to take place without a moment's delay. The unhappy travellers were not a little disturbed at these orders. Scarcely one of them was ready to leave the ship, and many were panic-stricken lest they should be left stranded at Porto Mexico, with no means of reaching Mexico City. Their fears were allayed somewhat by the news that the railway company had agreed to put a special train at their service; although it hardly compensated for the inconvenience to which this hasty landing subjected them. Their plight was ludicrous. Trunks were carried ashore half packed, their contents a desperate medley of crumpled garments. Bundles of every description were deposited on the quay, many insecurely fastened and gaping wide to show their heterogeneous contents.

A little after one o'clock in the afternoon the "Montevideo" put out again to sea, and as it turned out not a moment too soon, for an hour later an urgent message was received from the

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American cruiser stationed at Vera Cruz, bidding the "Montevideo" make all speed possible, as the town was to be bombarded at six in the morning of the 23rd. The vessel was therefore placed under its utmost steam, with the result that she made Vera Cruz before ten o'clock, and anchored just outside the harbour. All this time she had been in constant communication with the cruiser, and at last was able to inform the American captain that the "Montevideo" had arrived and was awaiting orders from the Spanish Consul. All night Sprice was on the *qui vive*, hoping every minute that these instructions would come, but all to no purpose. Not a whisper from the Spanish Consul reached them.

**Within Range of Fire.**

At half-past six the bombardment began. Sprice, with the captain and other officers, watched proceedings from the bridge. The whole of the line of battle was visible to them from this point of vantage. There was a continual movement among the soldiers, some placing cannon in position just outside the city; others, cavalrymen, galloping from point to point, and presently the guns began to fire in quick succession. The deep booming of the cannon completely drowned the intermittent noise of the quick firing guns. But at this juncture the captain deemed it advisable to stand further away from the shore in order to escape misdirected shots, and gave orders to weigh anchor. Almost as soon as this had been done a message was received from the American steamer, reporting many Spanish subjects on board. To this the captain of the "Montevideo" replied that if they wished he would take them off at once. An answer came, the acceptance of the offer by twenty of the passengers, and the further information that on Sacrifice Island, just a little way out from Vera Cruz, were several hundred persons, with hardly any food and no shelter, who would be very grateful for help. To this Sprice was ordered to telegraph back: "Am sending boats." At once the boats were got ready; one was sent off to the American steamer, and one to the island. The boat from the ship came back with sixteen refugees, and reported that thirty-two more were anxious to be transferred. To accede to the wishes of these self-appointed guests was no easy task, for the distance between the two steamers was about half a mile, and there was a heavy sea running. However, Sprice, as he was able to interpret for the passengers, was told off to captain a second boat going to the help of the steamer. He returned to the "Montevideo," to find that the boat sent to the island had come back with twenty refugees, and the officer reported that there were one thousand five hundred persons occupying the island, many were completely destitute, and some almost starving.

While the "Montevideo" was engaged in these good services, the battle on shore had been fought to a finish, and in the afternoon a report came through by wireless, stating that all was quiet, and an entry into the harbour could be effected without danger. The captain gladly availed himself of the opportunity to anchor in a less exposed position, but he was warned that none of those on board were to be allowed on shore that evening, a prohibition which, it is needless to add, was faithfully observed.

The next morning, however, the ban was removed and the passengers were able to visit the city. Evidences of the conflict were only too visible. Some of the houses and shops were riddled with bullets, while the stained and slippery state of the pavements bore witness of the fact that the victory had been far from bloodless. One building, the offices of a Vera Cruz paper, entitled *Blanco y Negro*, in the Calle 5 de Mayo, was a most conspicuous ruin. It was peppered with holes, and its façade was horribly blood-stained. Indeed, these gruesome evidences pointed to such promiscuous firing that one might suppose both sides to have shut their eyes when they pulled the triggers of their rifles.

**Sea Episodes.**

The adventures of this voyage, however, were not entirely over. On October 31st the "Montevideo" arrived at Habana, and left the same day for New York. Sprice reported the weather as insufferably hot, but expected a change would set in soon. He had not long to wait, for on the following day it was so cold that although he was clad in his very warmest rig, he could not keep warm. Shortly after a storm began to rise, and by six o'clock that evening the sea was running high and tossing the "Montevideo" about like a cork. Towards seven o'clock news came through that a collision between a sailing ship and a steamship had just taken place. The steamer was fitted with wireless, and was sending out for aid. The "Montevideo" answered her call, and received the reply that a revenue cutter and battleships were racing to her aid. Communication, however, was kept up between the two vessels, and we learnt later that the vessel, a Norwegian steamer, was gradually sinking, but was being towed into port by the cutter. Shortly after communication ceased; possibly the water had invaded her wireless cabin.

On the following day the "Montevideo" arrived in New York.

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## Football

It is doubtful whether any match in the fixture lists of the two Marconi clubs surpass in interest the annual encounters between the London Office and Chelmsford elevens. The keenest rivalry exists between the two clubs; but it is rivalry of the most wholesome character, limited to the arena. The supporters of each club are staunch believers in the merits of their respective favourites, yet in spite of the excitement engendered among them when the two clubs meet their fine sportsmanship enables them to meet in friendly intercourse after the matches.

The first of the two encounters of the present season took place on Saturday, November 16th, when a large party from the London office accompanied the team to Chelmsford. Both have been very successful in their league matches this season, and there was a quiet confidence of victory on each side. The game opened fairly evenly, but the downfall of the visitors' goal during the first ten minutes seemed to dishearten the London club, whose play suffered in consequence. Chelmsford played with fine dash and combination, and simply "walked round" their opponents, who were two goals down when the interval arrived. When the teams lined up again after a brief refresher it was noticed that the visitors had re-arranged their side. But that expedient availed them nought. The homesters continued to play in masterly style, and added three more goals before the final whistle was blown, leaving them well-deserved victors by five goals to nil. The condition of the ground after the heavy rains militated somewhat against good playing, but that, if anything, made the victory of Chelmsford all the more creditable. If they maintain their present form, we predict a very successful season for them, and nothing would please us better at the end of the season than to record their capture of the various trophies for which they have entered.

As to the London club, they need not feel disheartened because of their defeat, albeit it is the most severe trouncing which they have received this season. They were decidedly the inferior of the two teams on the day's play, the only redeeming feature of which, from their point of view, being a gallant revival during the closing stages, and the fine play by Cadman at left back and Lord at right half. The playing members have shown themselves in previous matches to be a first-rate team, and when the return match is played they are determined to show their Chelmsford friends that the latter caught them on an "off" day.

The following were the teams: Works. Waller; Greenaway and Love; Bedford, Fowler and Camenoil; Weldon, Rashbrook, Pemberton, Leggett and Hughes. London Office: Wagstaff; Mason and Cadman; Lord, Wedlake and Underhill; Noakes, Dodson, Menear, Littaur and Badder.

After the match both sides and their supporters met in the splendid new club house as the guests at tea of the Works club. In the evening a concert was held, over which Mr. C. Mitchell, the works manager, presided, supported by Mr. C. E. Turnbull, Mr. A. Gray, Mr. T. E. Hobbs and Mr. W. R. Cross from the London office. A feature of the excellent concert provided was the playing of the Marconi orchestra. Responding to the toast of the visitors, proposed by the chairman, Mr. Hobbs expressed thanks for the generous hospitality of their hosts, and, after complimenting the victors on the result of the game, he predicted that the return match would produce an entirely different result. Mr. Gray proposed and Mr. Turnbull supported a vote of thanks to the chairman, and with this an enjoyable evening was brought to a close.

The previous league matches of the London club this season resulted as follows: *v.* Talbot, won 1—0; *v.* Aster, draw 4—4; *v.* Maple Leaf, won 3—0.

## Movements of the Engineers

J. J. Leary, who is in charge of the work of erecting two high-power and several smaller stations in Chili, in connection with the Marconi Company's contract with the Chilian Government, sailed on R.M.S. "Oronsa" for Valparaiso, accompanied by H. Nicholls and B. S. Benning, who will assist in the work.

P. Croaker, assisted by H. Richmond, is at Carnarvon, Wales, engaged in preliminary work in connection with the erection of a high-power station.

S. L. Dashwood has returned to London from Poldhu.

D. H. and L. S. Payne have been temporarily transferred from Broomfield to Poldhu for experience in high-power work.

R. F. Pitcairn, who has been to Poldhu and Clifden stations for experience, is now at the Head Office, temporarily attached to the drawing office.

P. E. Privett, from Clifden high-power station, has been transferred temporarily to Broomfield.

F. E. Robinson and J. H. Shannon have been transferred from Broomfield to Poldhu, where they are temporarily attached for experience in high-power work.

A. G. Savill has returned to London from abroad, and is now temporarily attached to the drawing office.

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## Movements of Operators

L. W. G. Alford, from the "Agadir" to the "Montezuma."

W. F. Atkinson, from the "Cestrian" to the "Kenuta."

A. R. Akerman, from the "Highland Piper" to the "Tagus."

E. D. Bagot, from the "Olympic" to the "Orama."

G. Balding, from the "Galician" to the "German."

G. W. Balfour, from the "Lusitania" to the "Celtic."

V. W. Ball, from the "Corinthian" to the "Minnetonka."

C. H. Bartlett, from the "Pardo" to the "Kenilworth Castle."

T. Beamon, from the "Mongolian" to the "Durham Castle."

J. Biggins, from the "Vandyck" to the "Minneapolis."

A. G. Blow, from the "Armadale Castle" to the "Egypt."

A. B. Bower, from the "Goorkha" to the "Demosthenes."

H. S. Bride, from the "Medina" to the "German."

A. C. Brown, from the "Canadian" to the "Devonian."

A. F. T. Burgess, from the London School to the "Amazon."

A. E. R. Ballard, from the London School to the "Athenia."

T. S. Brosman, from the London School to the "Vandyck."

C. H. Brett, from the London School to the "Asturias."

A. C. Caldwell, from the "Braemar Castle" to the "Athenic."

F. N. Calver, from the "Antony" to the "Mandingo."

J. Camfield, from the "Celtic" to the "Haverford."

W. Condon, from the "Ascania" to the "Ausonia."

H. T. Cottam, from the "Athenic" to the "Goorkha."

K. S. Cawhey, from the "Empress of Britain" to the "Elmina."

R. Cox, from the "Durham Castle" to the "John Pender."

J. A. Craigie, from the "Cymric" to the "Lake Champlain."

B. A. Carter, from the "Ionian" to the "Hydaspes."

A. N. Clarke, from the "Navara" to the "Highland Laddie."

D. R. Cormack, from the London School to the "Numidian."

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J. W. A. Clark, from the London School to the "Oceanic."
D. Cohen, from the London School to the "Scotian."
H. E. Cutbush, from the London School to the "Caledonia" (Anchor).
F. Campbell, from the London School to the "Minneapolis."
J. E. Davies, from the "Stephen" to the "Canadian."
H. R. Dennis, from the "Ultonia" to the "Magdalena."
E. W. Dexter, from the "Caesarea" to the "Braemar Castle."
L. A. Dods, from the "Minneapolis" to the "Campania."
D. Donelly, from the "Victorian" to the "Haverford."
H. Donisthorpe, from the London School to the "Darro."
J. J. Donegan, from the Liverpool School to the "Carthaginian."
H. E. Earl, from the "Danube" to the "Vandyck."
B. F. Emery, from the "Oriana" to the "Delphic."
V. F. Evans, from the "Buratu" to the "Custodian."
P. S. Firth, from the "Minnehaha" to the "Idaho."
W. C. Gadd, from the "Grantully Castle" to the "Ruapehu."
F. L. Garraway, from the "Sardinian" to the "La Correntina."
B. A. Gillet, from the "Kildonan Castle" to the "Armadale Castle."
F. N. J. Gowlett, from the "Mooltan" to the "Grantully Castle."
R. A. Gascoigne, from the "Montezuma" to the "Highland Glen."
P. Greenstreet, from the "Ultonia" to the "Nubia."
D. Graves, from the London School to the "Arlanza."
A. J. Gregson, from the London School to the "Ionian."
H. Hayes, from the "Scandinavian" to the "Sardinian."
A. L. Henri, from the "Lanfranc" to the "Lake Manitoba."
H. Herd, from the "Letitia" to the "Scandinavian."
C. A. Hill, from the "Demosthenes" to the "Indarra."
T. Horne, from the "Highland Rover" to the "Ionian."
E. G. Hutton, from the "Vechis" to the "Arcadia."
J. A. Hempson, from the "Highland Glen" to the "Highland Rover."
B. J. Hibberd, from the "Caledonia" (Auchor) to the "Pretorian."
E. N. Hewitt, from the "Devonian" to the "Junin."
C. W. Herbert, from the Liverpool School to the "Andorinha."
W. Inder, from the Liverpool School to the "Maure tania."
F. V. Kinder, from the "Beltana" to the "Mooltan."
W. Lee, from the "Minnetonka" to the "Malwa."
S. A. Leith, from the "Dominion" to the "Pancras."
J. D. Lovelock, from the "Haverford" to the "Drumlanrig."
G. H. Lambert, from the London School to the "Ultonia."
C. F. Mackenzie, from the "Saturnia" to the "Itapuhy."
J. MacLeod, from the "Mamari" to the "Trent."
P. B. Maltby, from the "Elysia" to the "Empress of Britain."
J. Mather, from the "Maloja" to the "Asturias."
A. N. Matthews, from the "Athenia" to the "Carthaginian."
P. Mattock, from the "Teutonic" to the "Orcoma."
P. B. May, from the "Egypt" to the "Kildonan Castle."
W. J. McCutcheon, from the "Andorinha" to the "City of Dunkirk."
E. McKelvey, from the "Corinthian" to the "Ultonia."
A. H. Millard, from the "Cheyenne" to the "Waipara."
J. Moody, from the "Clifden" to the "Majestic."
F. H. Mawe, from the "Aguila" to the "Ardeola."
W. S. Morse, from the "Clyde" to the "Sumatra."
W. Murphy, from the "Franconia" to the "Darro."
P. R. Norwood, from the "Bohemian" to the "Celtic."
W. H. Nixon, from the "Highland Laddie" to the "Highland Brae."
H. Oliver, from the "Arlanza" to the "Highland Piper."
J. E. Osborne, from the "Sicilian" to the "Lake Erie."
D. O'Sullivan, from the "Cedric" to the "Adriatic."
C. W. Pain, from the "Victorian" to the "Buratu."
H. M. Palmer, from the "Lake Erie" to the "Hantonia."
W. Pettingell, from the "Arcadia" to the "Medina."
G. Plummer, from the "Minnewaska" to the "Agadir."
P. Plummer, from the "Minnewaska" to the "Mavaro."
H. Roffey, from the "Turakina" to the "Minnehaha."
T. Rookes, from the "Sardinian" to the "Parisian."
H. Rowlands, from the "Montfort" to the "Palawan."
W. C. Ryan, from the "Iroquois" to the "Orontes."
T. Robb, from the London School to the "Saturnia."
T. H. Sadler, from the "Lake Manitoba" to the "Lanfranc."
C. Searl, from the "Montcalm" to the "Dominion."
A. Schofield, from the "Ionian" to the "Berwick Castle."
P. S. Smith, from the "Cedric" to the "Empress of Ireland."
D. M. Sproat, from the "Hydaspes" to the "Mendi."
W. P. Spurgeon, from the "Corinthic" to the "Cawdor Castle."
W. K. Schneider, from the "Highland Scot" to the "Galician."
A. F. Smith, from the "Ionian" to the "Mamari."
W. E. Sandon, from the London School to the "Royal George."
G. W. Smythe, from the Liverpool School to the "Franconia."
C. E. Stannard, from the London School to the "Tagus."
W. Smith, from the London School to the "Minnewaska."
E. Sharples, from the Liverpool School to the "Victorian" (Allan).
W. H. Thomas, from the "Canopic" to the "Winifredian."
E. J. Trail, from the "Makrini" to the "Navara."
G. R. Tyler, from the "Mendi" to the "Cymric."
A. Thomson, from the "Letitia" to the "Sardinian."
G. Tilford, from the "Mauretania" to the "Franconia."
W. Taylor, from the London School to the "Grampian."
T. R. Walker, from the "Teutonic" to the "Victorian."
J. N. Ward, from the "Adriatic" to the "Caronia."
G. J. Wright, from the "Goth" to the "Makarini."
L. A. Walters, from the "Ascania" to the "Ausonia."
F. M. Wright, from the London School to the "Lake Erie."
W. J. Wing, from the "Runic" to the "Parisian."
G. V. Williams, from the "Hesperian" to the "Columbia."
G. O. Whitaker, from the London School to the "Vauban."
A. L. Yates, from the "Arlanza" to the "Italia."
W. P. Yelland, from the "Inkosi" to the "Galeka."
A. T. Yelding, from the London School to the "Oruba."
F. E. Young, from the London School to the "Asturias."

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THE MARCONIGRAPH

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# Where "Wireless" Alone Can Live.

THAT wireless telegraphy is available where the uses of the ordinary telegraph or cable are nullified is a matter of common knowledge, but the conditions under which this primitive system is rendered useless are usually connected with climatic influences, or the mischievous interference by enemies or malefactors. But in East Central Africa there exists a race which will not allow any other system than that of wireless telegraphy to exist. They are a primitive people, so innocently minded that they do not understand what theft is, and at the same time they have an unfortunate partiality for wire. As a result, it is impossible to erect telegraph poles with the necessary copper strands across the district, for once their erection is completed and the lines left unguarded, a raid is made on the pretty toy by these negroes, and the wire is converted into bracelets, necklaces, and other vain trifles. But let Mr. Felix Oswald tell the tale of this strange race of negroes whom he has discovered near Karungu on the eastern coast of Lake Victoria Nyanza, and of whose state of life he gave an interesting discourse before the Royal Geographical Society on December 16th, 1912.

The tribe, he said, belonged to the Jalwo Kavirondo—a race of hilotic negroes with a notable admixture of Hamitic blood. They are remarkable for their nudity and their utter lack of self-consciousness in this respect, just as if they were living in the Garden of Eden before the Fall.

Their standard of morality is conspicuously higher than that of neighbouring tribes. As a consequence they are a vigorous race, increasing in numbers, whilst the Nandi, owing to their lax morals, are dying out. They subsist entirely on millet and sour milk, only eating meat when any of their cattle or sheep die a natural death or when indulging in sacrificial feasts, on such occasions as the funeral of a chief. However, their physique is magnificent, and their power of bearing burdens is unexampled. Sometimes there is a small plantation of tobacco outside one of their homesteads, for they are confirmed smokers, the women more so than the men, and it is not uncommon to see even a young girl of thirteen smoking one of their long-stemmed pipes bound round with iron wire.

The women rarely wear anything but a string of blue beads or cowries round the neck and another round the waist, with an occasional coil of iron on the arms or legs; or, if married, a tail of grass fibre, the distinguishing badge of matrimony, is attached to the waist-belt. Old women often wear in addition a fillet of cowries encircling the forehead, probably as a sign of mourning. But the men have a passion for ornament, especially for coils of brass and iron wire. No bit of iron comes amiss to the Kavirondo men, and they even twist wire into large spectacle frames in imitation of European travellers. Hence it has not been found possible to run telegraph wires across the country, excepting along the well-patrolled Uganda Railway, but there is now a project for linking up the outlying Government stations by means of wireless telegraphy.

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M. CHARLES BALSER

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# M. Charles Balser

## Director of the Compagnie de Télégraphie Sans Fil, Brussels

ONLY recently one of the oldest firms on the Stock Exchange announced its impending resignation, and justified its action by declaring its intention of "working on broader lines as bankers and financiers."

This is a singularly happy phrase, for it exactly "places" the position of the great banker or the great financier in respect of his relationship with the community at large. At the same time it must be clearly understood that such a statement does not in any way infer a comparison between these two branches of commercial enterprise. Each has its own particular service to render to the public. Nevertheless, it is the banker who more particularly holds, by virtue of his office, a recognised position as guide, counsellor, and friend of the public. Into his keeping is entrusted the golden store of many a private purse, varying perhaps in the roundness of its sum, but representing infinite toil and patient thrift—the two principal factors of a nation's prosperity and power. For it should never be forgotten that though a nation may boast of its wealth, or of its vested interests, such wealth is of itself worthless; it is the energy and industry represented by the shining gold and the crisp paper currency which stands for the nation's credit and makes the boast tolerable. This then is handed to the banker to take charge of. Like a benevolent guardian, he sees what can best be done with it to further the interests of his wards. The very conditions of the trust involve his laying out the money to the fullest advantage, and in this way he is called to exercise a dual function—that of sower and reaper in the world's mart. The aggregated amounts entrusted to his care give him a powerful control over the affairs of men, so that not only is he the guardian of the individual interest, but the steward of the State; and if he be true to his trust, he weighs the merits and demerits of this or that scheme, supports whole-heartedly those enterprises which tend to the common good, discountenances the projects of fraudulent, idle schemers, and in this way keeps the balance of his country's prosperity. Considering their heavy responsibilities and the difficulties of their position, it is remarkable how few bankers there are who fail in this position of public trust, while those who carry it out well and faithfully receive, and justly, the esteem of their fellow men.

Foremost in the ranks of these princes of finance is M. Charles Balser. He is one of the most prominent figures in Belgian banking circles. He was head of the well-known banking firm of Balser & Co., which was for many years one of the principal banks in Brussels. In 1908, however, the important banking firm which is perhaps better known as the Deutsche Bank of Berlin entered into negotiations with M. Balser for amalgamating in Brussels his bank into their company, and finally an arrangement to this effect was completed, and on this occasion M. Balser became one of the directors of the old German bank.

It was in 1900 that M. Balser first came in touch with wireless telegraphy, and immediately recognised its importance as one of the coming factors in international communication. On the other hand, his ripe business experience found a suitable outlet in the Marconi International Marine Communication Co., Ltd., which had then but recently come into existence, and M. Balser was one of the first directors of the company and its ally, the Compagnie de Télégraphie Sans Fil, Brussels.

But the name of M. Charles Balser is known far and wide as a synonym for loyalty and business integrity. He has been a director of the Banque d'Outremer and many other important Colonial concerns since their foundation. He is chairman of the Société Belgo Allemande du Congo, the first German commercial house established in Central Africa at the Stanley Pool since the Franco-German Treaty of 1911, and is also a director of the Chinese Engineering and Mining Company.

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# On some Directive Aerials

**By Dr. E. Bellini**

THE Marconi vertical aerial radiates equally in every direction, and receives equally from every direction. The Marconi horizontal aerial radiates principally in a given direction, and receives best from the same direction. This latter is therefore a directive aerial.

Other directive aerials can be obtained by using two or more vertical Marconi aerials. We shall consider here only the case of two such aerials oscillating with a phase-difference of half a period, and the case of aerials derived immediately from such a pair.

The oscillating currents in two vertical aerials are said to have a phase-difference of half a period when, being at the same frequency, they pass through zero value at the same instant, and an instant later one of them is directed towards the sky and the other is directed towards the earth.

It is evident that if the two aerials are equal and very close together, and the currents in them have the same intensity and the same damping, their effects are equal and opposite in every direction. But if we put them some distance apart the conditions change. Let us suppose that A and B (Fig. 1) are the projections on the horizontal plane of these two aerials, the distance between them being *d*. It is evident that a receiving station situated on the line MN, at right angles to AB, and passing through the middle point, O, cannot receive anything, the current in the aerial, A, generating in the receiving aerial an electromotive force equal and opposite to that generated in it by the current in the aerial, B.

But if the receiving station is situated on the line AB then the electromotive forces are no longer in opposition of phase, as the waves generated by one aerial have to travel a longer distance before reaching the receiving station than the waves generated by the other aerial. Moreover, if the distance *d* is equal to half the wave-length radiated, it is easy to see that the two electro-motive forces not only will *not* be in opposition of phase, but they will coincide in phase, and will *add* completely one to the other.

That is in the direction along AB. In all other directions the phase-difference between these two electromotive forces will be sensibly the same as if the two aerials were at a distance apart equal to the projection of *d* on the direction considered. Thus, in the case of the direction OC this phase-difference will be that corresponding to the distance *ab*, *ab* being the projection of AB on the direction OC.

It can be demonstrated that the intensity of the current in a receiving aerial situated at a great distance in a direction OC making an

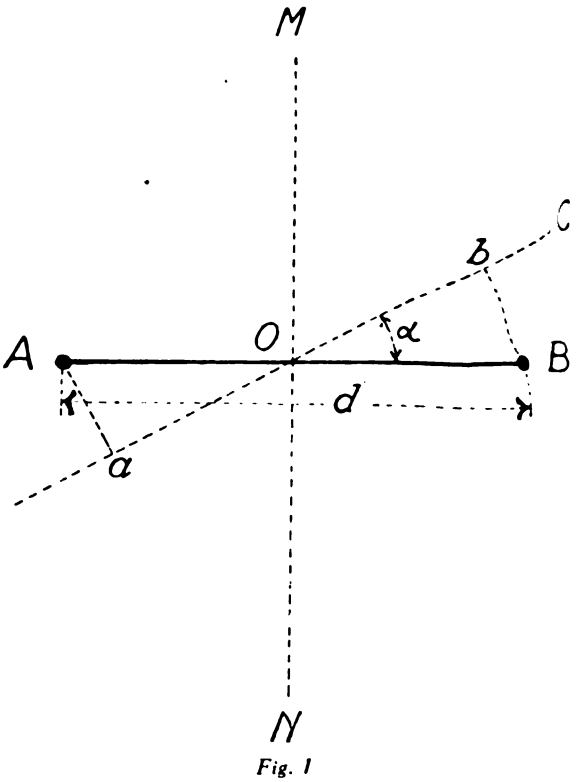


*Fig. 1*

angle $\alpha$ with the direction AB, is proportional to

$$\sin\left(\frac{\pi d}{\lambda}\cos\alpha\right),$$

where $\lambda$ stands for the wave-length of the radiated wave.

If we suppose that the receiving station turns round the directive aerial, remaining at

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a constant distance from the point O, the current intensity in the receiving aerial can be represented by a polar diagram. Fig. 2 shows

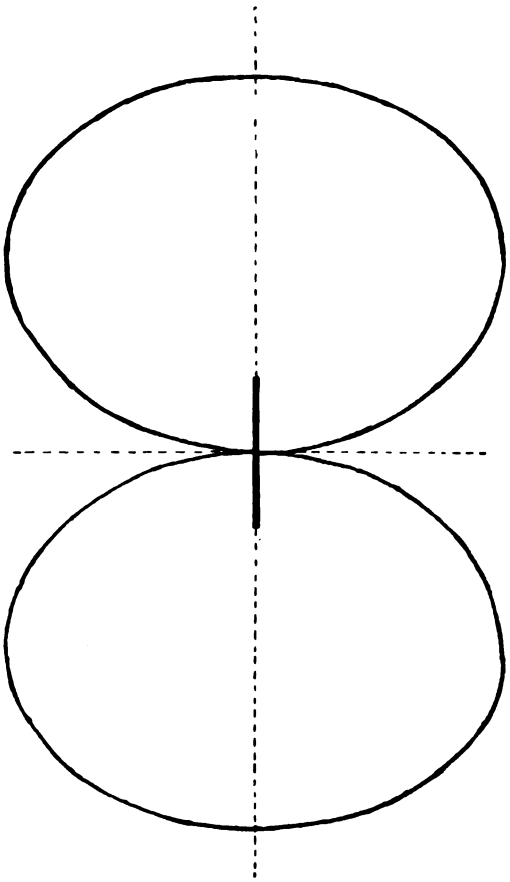

*Fig. 2*

such a diagram in the case of $d=\frac{\lambda}{2}$. It is formed by two flat tangent curves. But when $d$ diminishes with regard to $\lambda$ these curves tend to become circles, so that from $d=\frac{\lambda}{6}$ downwards these curves are practically circular. Fig. 3 shows this case.

The range of these directive aerials depends, apart from other factors such as current intensity, height of aerials, etc., on the distance between the two vertical aerials forming the directive aerial. The intensity of the electromagnetic field generated at a point lying in the direction of maximum radiation—viz., in the plane of these two vertical aerials, is proportional to $\sin \frac{\pi d}{\lambda}$.

The diagram of Fig. 4 shows how this intensity varies as a function of the ratio $\frac{d}{\lambda}$. It shows that :

(1) The intensity of the electromagnetic field is maximum when $\frac{d}{\lambda}=\frac{1}{2}$.

(2) This intensity does not vary much when $\frac{d}{\lambda}$ lies between $\frac{1}{2}$ and $\frac{3}{8}$.

Moreover, it can be demonstrated that :

(1) The intensity of the electromagnetic field generated by the directive aerial is double that generated by one of the vertical aerials, when $\frac{d}{\lambda}=\frac{1}{2}$; and

(2) The former intensity is equal to the latter when $\frac{d}{\lambda}=\frac{1}{6}$.

We have supposed that the two aerials were

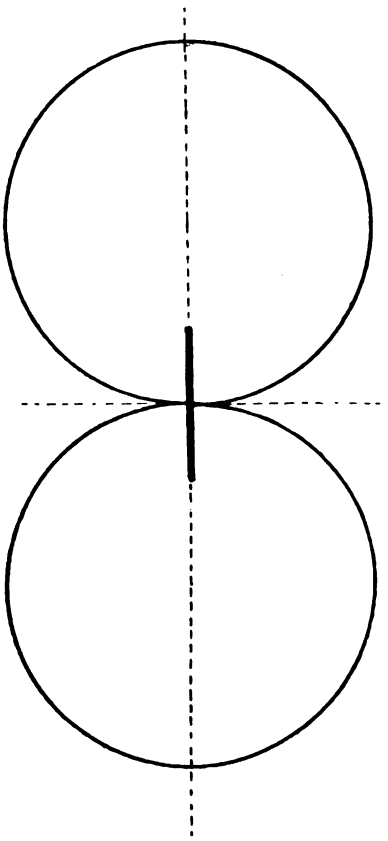

*Fig. 3*

connected to the earth, but it is easy to see that the earth in this case has no immediate action. As a matter of fact the earth receives

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from one aerial a quantity of electricity equal, and of opposite sign, to that received from the other aerial. Its potential therefore does not vary; the earth acts as a simple conductive

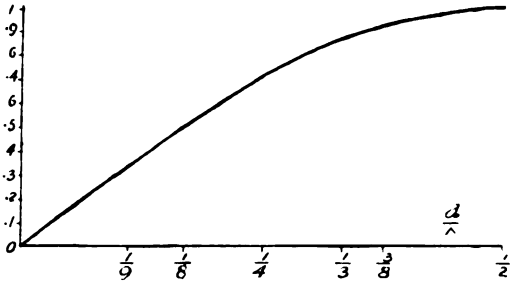


*Fig. 4*

connection between the bases of the two aerials. We, can, therefore, substitute for it a metallic connection, as shown in Fig. 5, and excite the combination of the two aerials by a jigger and a closed circuit. In practice this is of enormous advantage, as otherwise it would not be possible to excite the two earthed aerials so that a phase-difference of half a period could be generated and maintained in them. Moreover, as the horizontal conductor does not radiate appreciably, this unearthed aerial is quite equivalent to the pair of vertical earthed aerials.

Let us now consider looped aerials of whatever form we please, provided that they conform to the condition that they are symmetrical in regard to a vertical axis, MN, as shown in Figs. 6 to 11.

We can imagine each of these aerials divided into pairs of elements by infinitely close

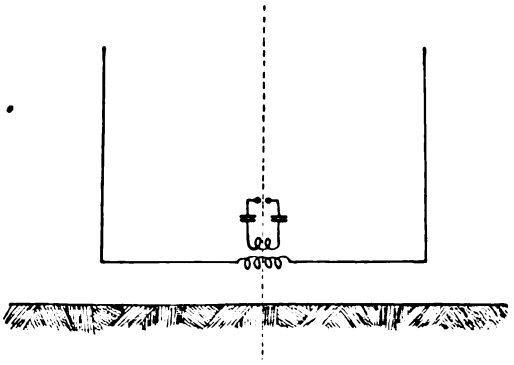

*Fig. 5*

horizontal planes such as *mn* and *op*. The currents in the two elements, *a* and *b*, are equal and in opposition of phase. These elements, *a* and *b*, will therefore act as an infinitely small directive aerial of the type already considered, having, however, the projecting-up parts not

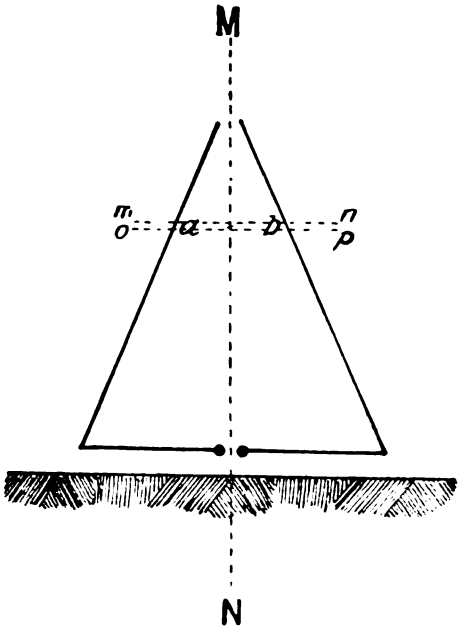


*Fig. 6*

vertical, but equally inclined to the vertical. The consequence of this inclination is that the action of the pair of elements considered is

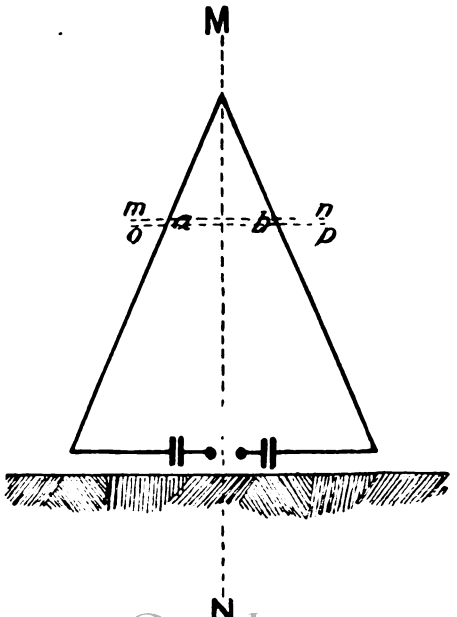


*Fig. 7*

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smaller than if the elements were vertical, but it has no influence whatever on the form of the

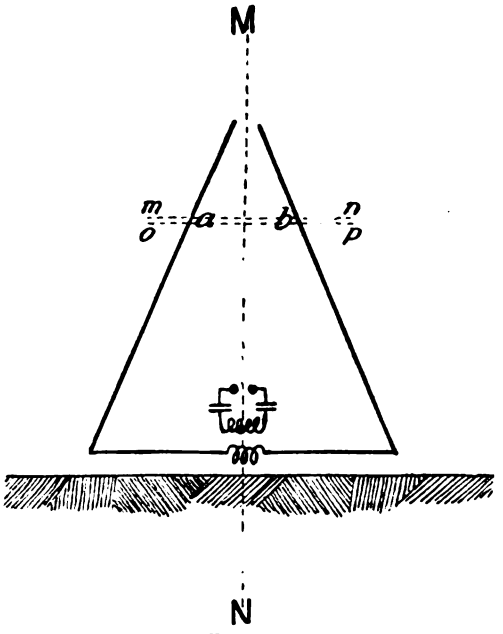


*Fig. 8*

polar diagram. The resultant action of all the pairs of elements such as *a* and *b* (viz., the action

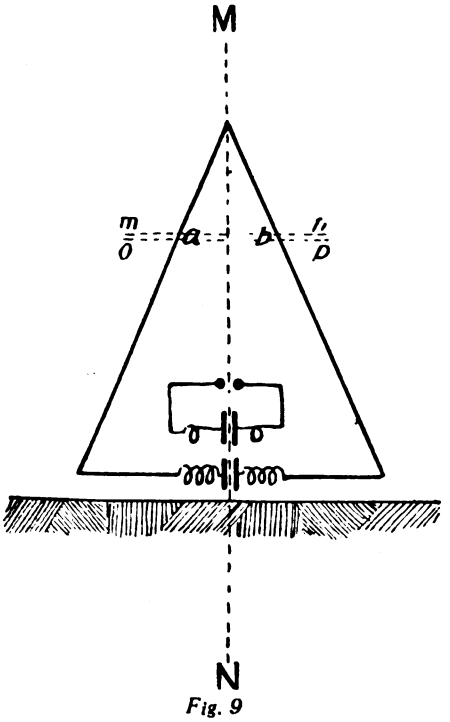


*Fig. 9*

of the looped aerial) will be the sum of the actions of all the pairs of elements, and if the maximum width of the aerial does not exceed $\frac{\lambda}{6}$, the diagram of the intensity of electro-magnetic field generated by these aerials will be formed by the two tangent circumferences, like those of Fig. 3. The looped aerials are therefore directive aerials, having the direction of maximum radiation contained in their own plane; perpendicularly to their plane the radiation is *nil*.

The reciprocity between transmission and reception has for consequence the fact that these aerials are directive also for reception.

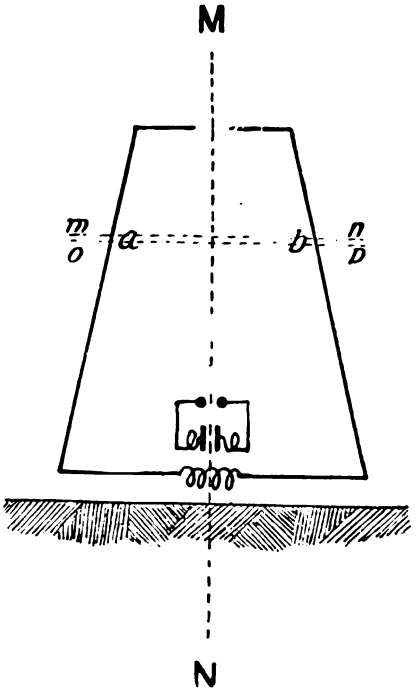


*Fig. 10*

If we suppose a sending station (with a vertical aerial) to turn around a directive receiving aerial, remaining always at the same distance from it, we can plot a polar diagram representing the current intensities in the receiving aerial as the direction of the transmitting station changes. These diagrams are identical with those of the intensity of the electro-magnetic field generated by the same directive aerials employed as transmitters; so that the diagram of Fig. 2 represents also the diagram of current-intensity in the directive receiving aerial when $\frac{d}{\lambda}=\frac{1}{2}$, and the diagram of Fig. 3

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represents also the diagram of current-intensity when $\frac{d}{\lambda}$ is equal to or less than $\frac{1}{6}$.

If in the aerials of Figs. 5 to 11 we replace the spark-gap by a detector, they will represent directive receiving aerials.

The method of employment of such directive aerials is obvious. Let us suppose, for instance, that a station, A (Fig. 12), is required to send messages to a station B, but at the same time it must be avoided that the messages should be picked up by a station C. This can be accomplished by arranging the direction of the directive aerial at A, so that its plane is perpendicular to the direction, AC, as shown in the figure. The most favourable conditions are obtained when the direction AB is at right angles to the direction AC.

Again, let us suppose that the direction of an unknown sending station is required to be found. To obtain it, we can swing the directive aerial connected to the receiver around a vertical axis, and find the position of it corresponding to the reception of maximum intensity. The

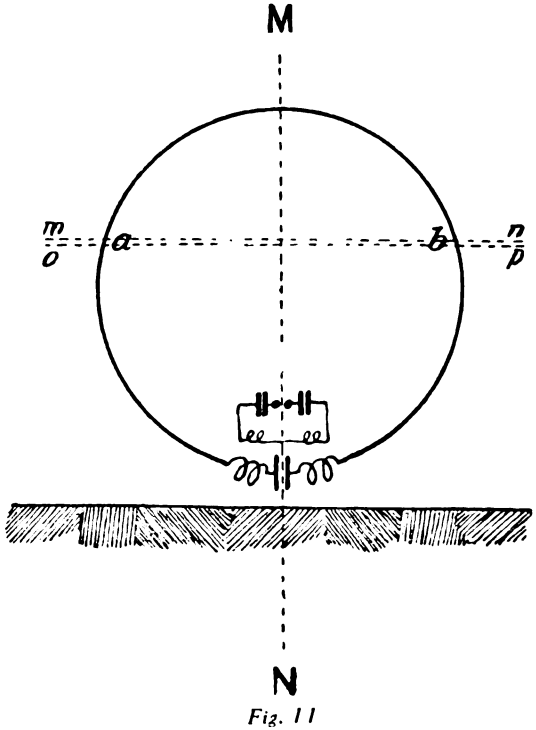


*Fig. 11*

unknown station is then contained in the plane of the aerial.

But the direction of maximum reception is not sharply defined, as the curves of current-intensity (Figs. 2 and 3) are flat at the top. The best method, therefore, to obtain the required direction is to swing the aerial to both sides of the maximum, and to find out the

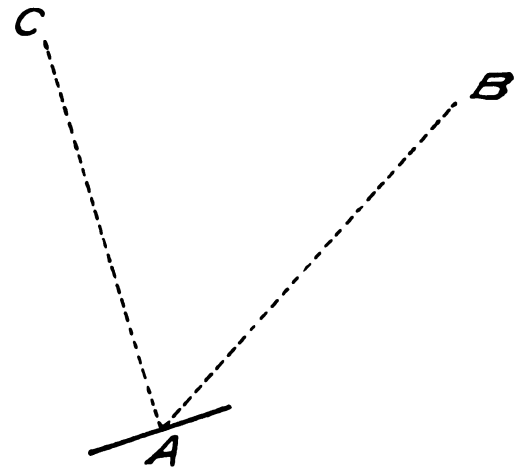


*Fig. 12*

two limits of direction beyond which the reception ceases. The line bisecting the angle formed by these two limiting directions gives the direction required.

But the swinging of aerials both for transmission and reception is practically impossible, unless they are of very small dimensions, and consequently of a very limited range. One way of avoiding this inconvenience is to employ a number of aerials arranged in star-fashion, using for transmission the one whose plane is closest to the required direction, and for reception testing which one of these aerials gives the maximum or the minimum current-intensity.

Instead of employing a number of such aerials arranged in star-fashion, two aerials alone can be used, at right angles, in conjunction with the radio-goniometer. This method has already been described in THE MARCONIGRAPH of September, 1912.

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After the usual business had been transacted at the "Sir Wilfred Lawson" Division of the Sons of Temperance Friendly Society, held at the Infants' Schoolroom, Queen's Road, Buckland, near Portsmouth, Bro. W. Smith, the Grand Treasurer of the district, gave a lecture on wireless telegraphy, demonstrating his explanation with small instruments he had prepared.

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## "Experto Crede"

**By "An Engineer"**

A STORY is told of an expert in that exhilarating game for juvenile minds—ping-pong—who was taken to witness a game of lawn tennis. By dint of persistent practice in the table game this gentleman had developed all kinds of fancy strokes, and in his local ping-pong club he had become the admired of all eyes.

He felt absolutely at home while watching the game of tennis. There was the net—a little higher, it was true, than the one over which he was accustomed to send his "teasers," but that was of little importance—there were the balls, the racquets, just as there were in his pet game. In fact, but for a slight difference in rules, it was ping-pong, only on a slightly larger scale; and, as he was an adept in the latter game, he felt he would like to display his prowess on the tennis court. Accordingly he challenged the winner of the game he was watching, and, seizing the vanquished player's racquet, stood ready to meet his opponent.

### An Erring Adage

We will draw a veil over the disastrous scene that followed, for the incident has been mentioned only to illustrate an attitude of mind which is not unknown in technical circles. It represents the argument *a fortiori* run wild, and the failure of quite a number of moral precepts widely disseminated, and which are exemplified in the adage: "Look after the pennies, and the pounds will look after themselves." However true such a precept may be, it can only lead to disastrous results if indiscriminately applied. Thus, a woman who was most scrupulously precise in her pin-money accounts would soon find herself at sea if she were suddenly confronted with the complicated financial affairs of a large business. The intelligent amateur who has dabbled all his life in home-made electricity—little motors, dynamos, wireless stations, and so forth—would be lost if he were plunged into a modern power station. Even the real expert finds himself "up against" difficulties of which he knew nought when he entered a larger sphere than that in which he was accustomed to move.

Mr. Duddell, in his interesting presidential address, from which we quote on page 430, lays stress on the advantages of high notes for wireless signals, quoting results of his own on the comparative sensitiveness of the telephone, combined with the ear, to notes of various frequencies. From these laboratory results, no doubt, Mr. Duddell would unhesitatingly decide to equip his wireless station, if he were to design one, with a transmitter giving a note of 900 or thereabouts. Apparently he would be right in doing so. But now comes one of those little details which Mr. Duddell could not be expected to know. Only the vast experience of a company, like the Marconi Company, which has been doing commercial wireless for years in every part of the globe, could tell him that all his advantages, so apparently important and convincing, are counterbalanced by the great disadvantage that the human ear tires more rapidly listening to high notes than to medium notes, a fact that is of great importance for prolonged commercial work.

The writer of the comment in last month's MARCONIGRAPH on the paper therein reproduced on flowing liquid dischargers, remarks:

> "It would be interesting to know how these methods would behave on higher powers, where so many excellent laboratory results behave in an unexpected and disappointing manner."

### Impracticable Ideas

There is a good deal of truth in this, which at once forms one of the difficulties and one of the fascinations of wireless research. It also explains why such a vast proportion of the patents taken out yearly in connection with wireless telegraphy come to an obscure and early end.

Argument from the small to the large, from the laboratory to the power-house, from the experimental interchange of signals to the day and night service of the modern Marconi station, is as dangerous and unreliable in wireless as such argument generally is in the affairs of everyday life—or more so. "Experto Crede" is the only trusty motto to follow.

The managing director of the Marconi Company, in his reply, quoted in last month's MARCONIGRAPH, to the Federal Telegraph Company's statements regarding their San Francisco and Honolulu stations, is laying down this same good rule.

> "The long experience," he writes, "which we have had, and the knowledge of the necessities for the conduct of such a service" (commercial service) "calls for a station of a very different construction, and one of which the Federal Company has neither knowledge nor experience."

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At a meeting of the Manchester Rotary Club, Mr. James McKeever, of the Northern Wireless Schools, Ltd., delivered a lantern lecture on wireless telegraphy, which was followed by a paper by Mr. A. L. Dugson, showing how he fitted up his private wireless installation. Members of the club were also entertained by listening to actual messages transmitted across the building on a model installation.

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# The Engineering of Wireless Telegraphy

THE inaugural address of the new President of the Institution of Electrical Engineers, Mr. W. Duddell, F.R.S., covered a wide range, and, unlike many addresses which have been delivered under the auspices of the premier electrical institution, it touched upon telegraphy. Naturally mention was made of the progress in wireless telegraphy, and in recalling the great interest that was awakened when in 1899 Mr. Marconi read his paper on wireless telegraphy before the Institution of Electrical Engineers, Mr. Duddell said :

" Since that date we have had a number of papers dealing with different parts of the apparatus, but we have not had a general review of the subject. The principles are well known. At the transmitting end we require to produce in the aerial conductor high-frequence currents of considerable power and of one definite frequency and to radiate the energy. At the receiver we wish to absorb the radiant energy, and to convert the high-frequency current in the aerial into audible or visible signals. The exact mechanism of the means of transmission between the two aerials is at the present moment under discussion, and opinions differ as to how far waves through the air, waves through the earth, and waves on the surface of the earth take part in the transmission. The matter has been very ably expounded in a paper by Professor Fleming, which was discussed at the last meeting of the British Association. The general conclusion seems to be that Hertzian waves propagated through the atmosphere are sufficient to explain transmission over short distances, but when we come to consider the observed bending of the radiation around the curvature of the earth, it is necessary to take into account the fact that the earth is far from being a perfect conductor, that the upper layers of the atmosphere are far from being insulating, and also the effect of sunlight on the conductivity of these upper layers. It must be remembered that the waves are being regularly transmitted round one-eighth of the earth's surface, and that Mr. Marconi has received signals over 6,000 miles ; that is, round one earth quadrant."

*Mr. W. Duddell, F.R.S.*

Turning from theory to practice, Mr. Duddell said :

" The engineering problems which confront us at the transmitting end are the design and support of the aerial conductor, the machinery to produce in it high-frequency currents of one definite frequency and of considerable power, and the mechanism for cutting up the high-frequency currents to form the dots and dashes of the Morse code. The changes that have taken place in the design of the aerial have been mainly in two directions—the one to make it more suitable for the longer wave-lengths now in use, and the other to give the aerial such a shape that the radiation may be much stronger in one direction than in any other. The first desideratum is obtained by extending the height of the aerial and by increasing the capacity of the condenser formed by the upper part and the earth. The Eiffel Tower aerial, which consists of an inverted fan of six wires 300 metres high, and the Nauen aerial [destroyed by a gale, 1912] in the form of an umbrella and 200 metres high, are examples.

" Of the directive aerials, the Marconi type, consisting of a comparatively short vertical part and a much longer horizontal part, is the only one that has come into use for long distances. As an example, the aerials proposed by the Imperial Wireless Scheme are to be 300 ft. high, and apparently some two or three thousand feet long, supported by ten steel masts. The design of an inexpensive form of mast to carry the aerial is a difficult engineering problem.

" The forms favoured at the moment are

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sectional tubes and lattice-girder constructions supported by stays.

"The type of generating plant depends upon the system employed, and here it is necessary to distinguish between the two forms which the high-frequency currency in the aerial may take.

"In the first form the amplitude of the high-frequency current in the aerial starts at zero, rises rapidly to a maximum value, and then dies away again. In the second form the current is of constant amplitude exactly similar to that produced by an alternator. Considering the first and older form, the oscillations are produced by the sudden discharge of a condenser through a small self-induction. If the condenser be charged by means of an alternator, in general one discharge will be obtained across the spark-gap with the corresponding train of oscillations during each half-period, thus the number of trains of oscillation per second is equal to twice* the alternator frequency.

"If we have a given amount of energy to transform per second, the higher the spark frequency the less the energy to be dealt with at each spark. Further, for a given size of condenser, the less the energy the less the voltage to which it will have to be charged. Hence, there are certain advantages in the high-spark frequency, and a further advantage will appear when we consider the receiver.

"The spark frequency has gradually increased from 10 to 20 per second with the induction coil to 100 to 200 per second, corresponding to commercial alternating-supply currents, up to 1,000 to 1,200 obtained from special designs of alternators.

"A method much in use for obtaining a high-spark frequency from an ordinary, say, 50-frequency supply is to employ a rotating spark-gap or discharger. The apparatus consists essentially of a number of revolving electrodes, which in turn come between the fixed electrodes of the spark-gap and cause discharges to take place, shortening the sparking distance. The number and speed of the revolving electrodes is so chosen as to give the required spark frequency. If such a discharger is used in connection with a continuous current, as is done at Clifden, one discharge is obtained each time the electrode or stud passes between the fixed electrodes of the gap. In the case, however, of an alternating-current supply the matter is a little more complicated, because the potential of the condenser varies according to the different parts of the wave-form at which the discharger causes the spark to take place.

"One great advantage of the revolving type of discharger over the older fixed gap is that the windage on the electrodes keeps them cool and blows away the conducting gases formed at each discharge, so that the gap rapidly passes from the conducting into the insulating condition. This is a matter of great importance, for if the gap did not rapidly recover its insulating properties an arc would be formed which would prevent the condenser being fully charged again."

**Reception of Signals**

Mr. Duddell later dealt with the actual manipulation of the signals, and then with the question of receiving. He said:

"The engineering difficulties which confront us in keying are really questions of switching on and off considerable powers a great many times per second with perfect certainty and definiteness in the contacts. In the early stations for a kilowatt or so the ordinary Morse key connected in the primary circuit of the transformer sufficed, but as the power got larger different types of relays were introduced. Some of these relays operated by interrupting the primary current, some the secondary current of the step-up transformer. In continuous wave systems on the arc method keying is sometimes carried out by altering the frequency by switching in and out self induction or capacity in one of the circuits. This has the advantage that the whole power is not interrupted, and it also keeps the load on the arc generator more constant, which tends to improve its steadiness. With alternators it is obvious that keying can be done in the field circuit, but with these machines another difficulty arises. When the load is thrown on and off the alternator there is naturally a tendency for the speed to fall and rise. If the speed varies the frequency and hence the wave-length of the radiation alters; this interferes with the tuning.

"Turning to the receiver, the changes that have been made are not so striking. The coherer has become practically obsolete. The magnetic detector which replaced the coherer about ten years ago still holds its own, although it is not very sensitive. Its reliability in action and the fact that it is almost fool-proof are for many purposes convincing arguments in its favour.

"The electrolytic detector has been but little used in this country. The Fleming valve and the crystal detector have come into considerable use. They are both highly

* This number can be varied by suitable adjustment, and several sparks may be obtained per half-period, or conversely a number of half-periods may elapse between the successive sparks.

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sensitive and depend upon the curious properties in the one case of the residual gas of the electric lamp bulb, and in the other case on the contact between two minerals. The property which makes them useful as detectors is in each case their unilateral conductivity. The high-frequency currents induced in the receiving aerial by the incoming waves are not generally sufficiently strong to affect any of our ordinary alternating current measuring instruments. If, however, they can be rectified and converted into continuous currents, then it is easy to detect them, for it is common knowledge that the direct-current measuring instruments are in general hundreds, if not thousands, of times more sensitive than alternating-current ones.

"Corresponding to each spark at the transmitter a train of oscillations is received, and these trains of oscillations are rectified by the detector, and in general are passed through a telephone as an indicator. At each spark a click is heard in the telephone, so that with 600 sparks a second the diaphragm is attracted 600 times, producing a somewhat musical note.

"Herein lies one of the great advantages of high-spark frequency. There seems no doubt that the combination of the human ear and a telephone is much more sensitive for high-frequency notes than for low ones. In some tests I have made, using an alternating current to determine the minimum power required to produce an audible signal in a telephone receiver at different frequencies, I found in one case that the power was reduced from 430 micro-microwatts at 300 frequency to 7·7 micro-microwatts at 900 frequency. At higher frequencies it increased again.

"Due to atmospheric causes, there are generally audible in the telephone receiver clicks and noises commonly spoken of as atmospherics or strays. With high-spark frequencies the human ear easily distinguishes the musical note from these atmospherics; this enables the operators to read through a large amount of extraneous interference. The elimination or compensation of these atmospherics is one of the most important outstanding problems in wireless telegraphy."

# Directive Wireless Telegraphy

A PAPER by Mr. F. Addey on "Directive Wireless Telegraphy" was read before the Institution of Post Office Electrical Engineers on December 9th, 1912.

He pointed out that at an ordinary wireless telegraph station the signals were radiated equally in all directions, and that, of course, for many purposes this was advantageous. In certain circumstances it was very desirable, however, to be able to restrict the signals sent out from a station to a definite line, and to receive signals only when they came from a definite direction. For instance, by directing the emitted waves in this manner, interference with stations lying off the line was avoided and energy was saved which would otherwise be wasted. At a receiving station a directive arrangement greatly reduced trouble due to interference from other stations and from atmospheric discharges. He pointed out that the simplest use of a directive aerial was to increase the range of a station in a certain direction. The large Transatlantic Marconi stations were provided with directive inverted L aerials, because they always worked in the same direction.

A most important application of directive systems was to enable ships to obtain the bearings of wireless stations on shore. When a ship was navigating within sight of shore her exact position was ascertained by the process known as "cross-bearings," and Mr. Marconi, in 1906, patented an arrangement for attaining this end. A number of inverted L aerials radiating at equal angular distances from a point were erected on the shore. By means of a switch the receiving apparatus could be joined to any one of these aerials. By ascertaining on which aerial the maximum strength of signals was received from a ship the direction of the ship was determined. The necessity of using a number of aerials could be avoided by building a single directive aerial in such a way that it could be rotated so as to radiate or receive along any required direction. There were obvious disadvantages in such a method, and Bellini and Tosi had devised a very ingenious arrangement by which a resultant aerial could be rotated while the actual aerial system remained fixed.

The method by which the ship could obtain her bearings without the co-operation of an operator on shore, that, namely, in which the ship was fitted with a directive installation to ascertain the direction of a non-directive installation on the shore, had been developed by the Marconi Company, and was known as the Marconi wireless compass. In this system a modification of the Bellini-Tosi system was used, the opposite halves of each directive aerial being joined together at the top.

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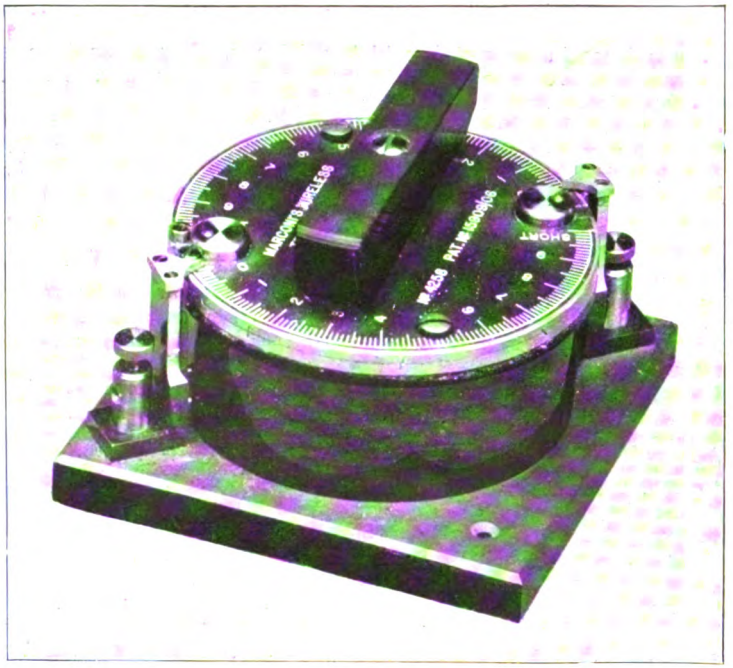
# Exhibition of Scientific Apparatus

THERE was a comprehensive display of electrical, optical, and other physical apparatus at the eighth annual exhibition of the Physical Society of London, which was held at the Imperial College of Science and Technology, on December 17th, 1912. The Exhibition, which was contributed to by over 30 of the leading firms, attracted a good attendance. The lecturer on this occasion was Mr. S. G. Brown, who delivered a discourse on "Some Methods of Magnifying Feeble Signalling Currents." As is well known, Mr. Brown is chiefly concerned with relays for telegraphic work, and he dealt with the problem of converting the indications of extremely feeble signalling currents at the end of a submarine cable into useful signals.




*Disc Condenser*

One of the exhibits which attracted considerable notice was that of Marconi's Wireless Telegraph Company, who showed as wide a variety of apparatus as the limited space allowed. The exhibit which perhaps attracted most attention was the wireless compass, which is an instrument for use with a directive aerial system, either for locating the direction of a wireless station or for directive signalling. As the compass has already formed the subject of two articles in THE MARCONIGRAPH, it is unnecessary to add anything on the present occasion. Next in interest came the Universal Crystal Receiver, which is designed to work with a crystal of the low-resistance type over a range of wave-lengths of 300 to 3,000 metres. The secondary and primary windings of the coupling inductances are each wound in three portions, which are connected in series for long wave-lengths. Adjustable condensers are provided for tuning the aerial and detector circuits. The crystal is protected by a screening box, and is automatically cut out of circuit when transmitting by means of small relays in the instrument.

The knapsack transmitting and receiving set served to demonstrate the possibility of communicating up to 15 miles. This portable outfit consists of a light telescopic aluminium mast, with aerial wire and earth net, a portable battery of dry cells or accumulators, a box for the transmitting, and another for the receiving apparatus. The latter is an inductively coupled circuit with tuning condenser and crystal detector.

Other apparatus exhibited was an improved pattern of the well-known adjustable ebonite disc condenser, the contacts being enclosed in the case; an instrument for measuring the decrement of an oscillatory circuit, which could also be used for measuring wave-lengths, coupling capacity, self and mutual inductance. In the pattern exhibited the decrement was determined by a thermo junction and low-resistance galvanometer. There is little to be said about the valve receiver, or the adjustable air condenser. The latter instrument has been

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designed to give the largest possible capacity for a given size.

The principal instrument on the stand of Messrs. Nalder Brothers & Thompson, Ltd., was that for measuring the insulation resistance and the leakage current flowing from the mains of single-phase or three-phase systems. The apparatus has been designed for use either on high or low tension circuits.

Some excellent types of unipivot instruments were exhibited by Mr. Robert W. Paul, and the working parts and constructional details of several types of instruments were open to inspection.

A new D.C. testing set was a feature of Messrs. Crompton & Co.'s stand. This instrument consists of one moving coil indicator, arranged so that it can be used either as an ammeter or voltmeter. The ranges available are from 0-75 millivolts to 0-600 volts, and 0-15 milliampères to 0-150 ampères, or further if desired. Other instruments on this stand were several types of round and sector moving coil and moving iron instruments for switchboard use, and a standard Crompton potentiometer with galvanometer and standard resistances.

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# Trans-Pacific Wireless Telegraphy

THERE has been some correspondence in *The Electrician* on the above subject. A letter from Dr. Lee de Forest raised a comparison between the efficiencies of the spark and arc methods of generating oscillations, and this brought from Dr. W. H. Eccles a reply, of which the following is an abstract:

"The position at present is somewhat as follows: The most trustworthy researches on the arc show that the over-all efficiency of transfer of energy reckoned between direct-current supply and antenna is less than 25 per cent. All these measurements have been made on arcs of much lower power than the new ones of the Federal Company. Now it is known that if the power supplied to the arc be raised by increasing the direct current, the representative point on the volt-ampere characteristic of the arc passes into less steep portions of the negative characteristic, and the oscillations get relatively feebler. Moreover, there are good physical reasons for supposing that the voltage across the oscillating arc must be kept below a rather low limit. Thus, so far as present-day science goes, the overall efficiency of the arc decreases as its power is increased. If this deduction from the common knowledge of the small Poulsen arc is not correct, it is to be hoped on scientific grounds that the Federal Company will permit some accurate scientific knowledge of their enormous arcs to be gathered and published. For it has obviously become financially impossible for private investigators, like myself, to follow this matter up in our own laboratories.

"As for the spark method of generating oscillations, we find that the modern short-gap methods, such as the Telefunken and the Marconi rotating discharger, have indisputably high efficiency. For example, the published measurements by Mr. A. J. Makower and myself show an overall efficiency of 50 per cent. with small plant on direct current, and it appears likely that this figure may be exceeded on large plants with alternating current. In fact, the Telefunken engineers and others took strong exception, it may be remembered, to our 50 per cent., as being much lower than their own measurements on larger plant. Possibly, an unbiassed judge would decide that the short-gap methods have an efficiency of over 60 per cent., and would remark that there is no known physical reason for a smaller figure arising at high powers.

"Summarising, in the present state of knowledge we are driven to conclude that the arc method transforms at most 25 per cent. of the electrical energy supplied into useful electrical oscillations, and at least 75 per cent. into local heat, while the modern spark transforms about 60 per cent. into oscillations, and 40 per cent. into heat. And it is probable, indeed practically certain, that these estimates err in favour of the arc. From all this we have to conclude that at stations radiating energy at equal rates the arc station generates twice as much local wasteful heat as the spark station.

"It is apparent, I hope, from this plain statement of known facts, that if the energetic directors of the American Poulsen interests wish to gain the sympathy of scientific engineers and investigators (and that they do is proved, Sir, by their addressing you) they ought to give us solid scientific measurement instead of unconvincing declamation."

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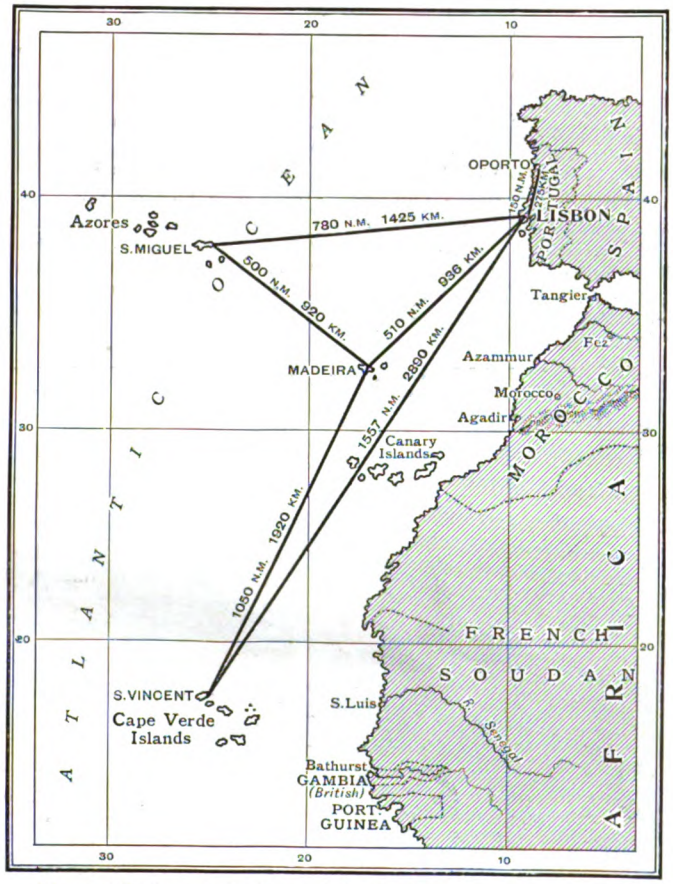
## Wireless Telegraphy in Portugal

THE contract for the erection of a number of wireless telegraph stations for the Portuguese Government was signed on December 7th by the Minister of Public Works, Francisco Jose F. Costa, and the Marquis L. Solari, representing Marconi's Wireless Telegraph Company of London. With the definite ratification of this contract, reference to which was made as far back as the April, 1912, number of the MARCONIGRAPH, Portugal will rank with other nations of the world enjoying the benefits of a wireless telegraph system. Such a possession must eventually become essential to any great maritime trading community, and the decision of the Portuguese Government to proceed immediately with the scheme is a welcome sign of a renaissance of Portugal's commercial greatness, for which we can find a parallel in the sixteenth century, when the influx of wealth furnished the economic basis for a sudden development of literary and artistic activity and culture.




*Marconi Stations to be Erected for the Portuguese Government*

Five stations in all will be erected. One of these will be in the Azores Archipelago, which lies due west of the Portuguese coast, a third of the way across the Atlantic towards America. Madeira, which lies to the south-west of the mainland, will be brought into radio-telegraphic communication with Lisbon, and much further away, within the tropics, and also in the Atlantic Ocean, is the Cape Verde Archipelago, on one of whose small islands the Government have decided to erect a station also. Each of these stations will be in direct communication with the station to be built at Lisbon. The fifth station will be at Oporto, and it will have a range of 500 kilometres. The Lisbon and Cape Verde stations will each have a range of 3,000 kilometres, Madeira, 1,900 kilometres, and the station on the Azores Island, 1,600 kilometres.

As will be seen from the map, this contract is of very great importance for the future development of wireless telegraphy between America and Europe, and West Africa, and for ships crossing the Atlantic. It is also a link in the chain of wireless stations between Brazil and Portugal, North America, England, and Portugal, and between Lisbon and all the Spanish, Italian, and English Marconi stations already open to public service. The geographical position of the station on the Cape Verde Islands will facilitate the development of a wireless service between Europe and South - West Africa.

The Madeira and Cape Verde stations will be of inestimable value to liners and other large ships proceeding from Europe to South Africa or to South America, and as about nine-tenths of the vessels on these routes fitted with wireless telegraphy are controlled by the Marconi Company or its associated companies, it will be seen that the traffic passing through these stations will be very great.

It should be mentioned that the Marconi system has been adopted by the Portuguese navy, and that many of the merchant ships are also fitted.

# The Marconi Headquarters in Italy

## And some Contracts

THE Marconi sphere of influence is limitless and its potency not to be gainsaid, for wherever civilisation has concentrated to form a centre of industry—a nerve centre, receiving intelligence from, and controlling the affairs of this mighty earth—there the Marconi organisation has its representatives, in order that it may furnish a means of communication between centre and centre. The simile is surely not *mal-apropos*, for wireless telegraphy is to this planet what the nerve is to the body—a means of flashing messages from quarter to quarter so swiftly, so unerringly, that the parts are able to take immediate action in response to the message received. Madrid, Paris, New York, Brussels, St. Petersburg, Hong Kong, Montreal, Melbourne, and Valparaiso—in all these cities, and many more besides, the Marconi interest is represented. Especially influential is the Rome office; but while in most of the foregoing cases Marconi wireless telegraphy is represented by affiliated companies, the Rome office is a branch of Marconi's Wireless Telegraph Company, Ltd., of London, ably represented by the Marquis L. Solari.

Many and important have been the contracts which it has carried out with the Italian Government. A detailed list would be wearisome to the reader, but mention must be made of a few of the more important transactions.

The highest power station that Italy possesses was erected at Coltano for the Ministry

*The Headquarters of the Marconi Company in Italy, occupying the whole of the second floor.*

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of Posts and Telegraphs. This station is capable of transmitting and receiving messages to and from ten thousand miles or more. Its available power is ten thousand kilowatts, and messages can be transmitted to Canada and America with the utmost ease. On the opening of the station the Minister of Posts and Telegraphs forwarded the following telegram to Mr. Marconi, in response to one received from him telling the Minister of the successful completion of the work :

" I thank you for your kind telegram, which I will make a point of communicating to-day to my colleagues of the Cabinet. The information that Coltano is now able to transmit to and receive from your English and Canadian stations will be much appreciated by my colleagues, as well as by the whole country. The trans-oceanic radiotelegraphic communication by means of the new high-power station will add to the triumph of your genius, and is a new instrument of civilisation and glory to the country."

Another station is at Bari, which is open to public service with the Balkan States, and three more have been erected at Naples, Cagliari, and Palermo, and these are open to public service amongst themselves, or can be used for communicating with ships at sea.

For the Ministry of Marine the Marconi Rome office have built a high-power station just outside the Italian capital, at Centocelle.

Other stations erected for this department of the Italian Government, for the purpose of marine communication, have been built at Capo Mele, Capo Sperone, Forte Spuria, Isola Chiesa (Maddalena), Monte Cappuccini (Ancona), Palmeria, Santa Maria di Leuca, Taranto Venezia, and Viesti.

*Mr. Marconi's Room in the Rome Office.*

Three stations have been supplied for the Ministry of Public Works—one at Messina, another at Reggio, and the third at Villa San Giovanni—and have been found of great service in establishing adequate control over the important ferry-boat service which connects Sicily and the numerous islands of the Mediterranean with the mainland of Italy.

The Colonial Office has also from time to time given instructions for the erection of important stations in various districts of the

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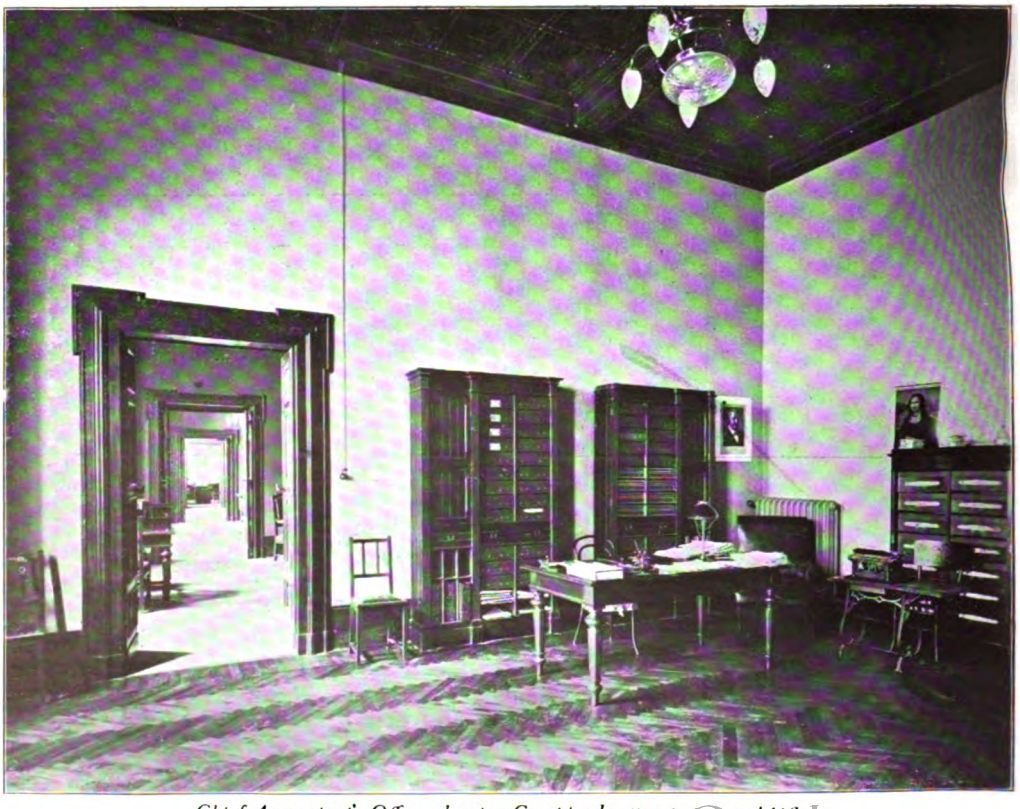
Italian colonies, and in no Government department has wireless telegraphy been found of greater use than in connection with the Colonial service. Italy has three Colonies—Eritrea, Benadir (or Italian Somaliland), and Libya, which consists of Tripoli and Cyrenaica. Eritrea is situated on the African coast of the Red Sea, and is bounded inland by the Anglo-Egyptian Soudan. The capital of the colony is Massawa, and here a high-power station has been erected which communicates with Coltano, in Italy, and Mogadiscio, in Somaliland. From this it would be gathered—and rightly—that Mogadiscio is supplied with a high-power station. But Italian Somaliland is well equipped with this means of communication, for stations have been erected in six of its more important towns—viz.: Bardera, Brava, Giumbo, Italia, Lugh, and Merka, while Mogadiscio is further supplied with means of ship and shore communication.

In no department of the service is the re-awakening of Italy more apparent than in the navy, and in witness of this the following facts are interesting. In 1900 there were eight first-class battleships, three armoured cruisers, four protected cruisers, and nine for foreign stations, while the fleet of torpedo-boats and destroyers was entirely out of date. To-day Italy possesses eleven first-class battleships, four Dreadnoughts (with two more nearing completion), ten armoured cruisers, a fleet of twenty-three destroyers, fifty-eight torpedo-boats, and twenty submarines. Nearly all of these vessels are fitted with wireless telegraphy, which has been installed by the Marconi Rome office, as the following list of equipments sufficiently demonstrates: Agordat, Alpine, Amalfi, Americo Vespucci, Ammiraglio Saint Bon, Andra Doria, Aquilone, Aretusa, Artigliere, Benedetto Brin, Bersagliere, Borea, Bronte, Calabria, Carabiniere, Carlo Alberto, Coatit, Corazziere, Dandolo, Dardo, Elba, Emanuele Filiberto, Espero, Etna, Etruria, Euro, Flavio Gioja, Francesco Ferruccio, Freccia, Fuciliere, Fulmine, Garibaldino, Giovanni Bausan, Giuseppe Garibaldi, Goito, Governolo, Granatiere, Iride, Italia, Lampo, Lanciere, Lepanto, Liguria, Lombardia, Marco Antonio Colonna, Marco Polo, Minerva, Napoli, Membo, Ostro, Partenope, Piemonte, Pisa, Pontiere, Puglia, Regina Elena, Regina Margherita, Re Umberto, Roma, Sardegna,



*Chief Accountant's Office, showing Corridor leading to General Offices.*

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Sicilia, Straffetta, Sterope, Strale, S. Giorgio, S. Marco, Trinacria, Tripoli, Turbine, Urania, Varese, Vittor Pisani, Vittorio Emanuele, Volta, Volturno, Vulcano, and Zefiro.

For the Ministry of War the Rome Office has supplied all the wireless stations, both fixed and portable, used by the Italian Army in Italy and her Colonies.

But the Government is not alone in recognising the efficacy of the Marconi system. All the important Italian steamship companies have entered into special agreements with the Marconi Company. They are: Navigazione Generale Italiana, La Veloce, Italia, Lloyd Italiano, Lloyd Sabaudo, Ligure Brasiliana and Sicula Americana, and it goes without saying that all the ships of these companies are fitted with Marconi apparatus.

The head offices of the company are, of course, established in the Italian metropolis, but Marconi's Wireless Telegraph Company have important workshops at Genoa, where wireless apparatus is constructed and repaired, and, if necessary, fitted on merchant ships which touch at this, the most important of Italian ports. At Genoa there is also a depôt for the inspection of Marconi ship stations.

The Marconi Rome Office is divided into four departments, each of which attends to a particular branch of the complex affairs of Marconi's Wireless Telegraph Co., Ltd. First, there is the Secretary's Department, which, besides carrying on all necessary negotiations with the Italian Government, or any of the foreign States who transact business through the Italian branch, carries on scientific investigation with regard to its development, and undertakes all business connected with the registration of payments.

The Technical Department, as its name implies, regulates everything that comes within the cognisance of the engineer; and there is besides an Accounting Department and Traffic Department — two indispensable branches of any well regulated house.

At the present moment, however, the congratulatory air is prevalent in all departments, for the whole office has just been transferred to new quarters on the second floor of the monumental palace of the Prince of Venosa in the Corso Umberto Primo.

This palace was built about the end of the eighteenth century from the design of the famous Italian architect, Alessandro Specchi, whose most important work was the construction of the Ripetta Bridge on the Tiber, which, however, is no longer in existence. It is one of the most important buildings of the Corso—the Bond Street of Rome—and, although belonging to one of the decadent periods in Italian architecture, it possesses none of the meritricious ornament which is typical of such buildings, but has a simplicity of outline and a quiet dignity which makes it an outstanding feature in this pathway of palaces. It was originally built for the De Carolia family, from whom it passed to the Simonetti family, and was afterwards purchased by the Prince of Venosa, who only recently sold it to the Banco di Roma.

The new owners immediately took in hand the task of converting the building into luxurious offices, fitted with all modern conveniences, and the Banco di Roma was installed in its new premises in January, 1912. Soon afterwards, as the result of negotiations between the Banco di Roma and the Marconi Company, it was arranged that the Marconi Rome Office should be installed in the second floor of the palace. In August last all arrangements were completed, and the Rome Office took possession of the apartments overlooking the Corso Umberto, which were the rooms formerly set apart for the exclusive use of the Prince of Venosa.

They consist of five large halls and ten rooms; the first is a waiting room, which opens on to the fine marble staircase. Adjoining this is a large hall, decorated in the renaissance style, with panels of green damask. Another hall is known as Mr. Marconi's room, and is reserved for the exclusive use of the great inventor. It is also renaissance in style, but is hung with Italian tapestry, beautiful and old. Similar to this is the Marquis Solari's private office, while the other two halls are used by the Technical and Accounting Departments, and the remaining rooms by the Traffic Department and various members of the staff. Throughout the apartments the flooring is of fine teak wood, and the ceilings of carved oak, with deep-set gilt panels.

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A lecture on "Radio-Telegraphy" was given by Mr. J. Ewen, M.B.A.A., before the Edinburgh Association of Science and Arts, on December 16th. The lecturer showed that wireless telegraphy was simply the development of the electrical researches made by Faraday, Hertz, and Clerk Maxwell. The credit of having turned these to practical account in this direction unquestionably belonged, he said, to Marconi, whose genius and indomitable perseverance had overcome innumerable difficulties. The wonderful devices for improving his instruments had been the marvel of the scientists. Notably, his skill had been shown in overcoming the prismatic effect of the sun's light on the electric waves.

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# The Gulf of Labrador Wireless System

**By Harold Dunn**

AMONG the various North Atlantic routes that which is known as the " Belle Isle " or " Gulf " route is becoming increasingly popular. This waterway connects the forts of Quebec and Montreal with those of Great Britain, and indeed with other European ports, for the tide of travel is an ever-growing one, and the development of commerce has resulted in the passage of a large number of cargo vessels along this route.

Those who are fortunate enough to make a trip across the North Atlantic during the dog days of August or September will find the Belle Isle - St. Lawrence route full of interest. Shortly before sighting land, and almost at the same time as a vessel comes within range of the Belle Isle wireless station, formidable-looking icebergs will appear on the horizon. It is then that minute care and skill must be exercised in the navigation of the vessel, and one is grateful to the foresight of the Canadian Government, who have provided means for depriving this hazardous route of many of its terrors. On the Atlantic coast of Canada, lighthouses using oil-vapour burners, diaphone fog-alarms, and last, but by no means least, wireless telegraph stations have been installed. The Canadian Government have from the first appreciated the possibilities of wireless telegraphy, and over a decade ago granted to Mr. Marconi a subsidy of $80,000 towards the equipment of a trans-atlantic station at Glace Bay.

Immediately on getting into touch with Belle Isle the captain makes use of wireless to ascertain the condition of the weather and the number of icebergs in the neighbourhood.

If the passengers are fortunate enough to pass Belle Isle in daylight and in the absence of fog, their attention will probably be attracted, on glancing over the starboard rail of the steamer, by the lighthouse and, immediately beside it, the Marconi mast. This lighthouse and Marconi station are erected on the highest land at the south-east end of the island, and about 360 feet above sea-level, making the top of the mast considerably over 500 feet above the sea. Another lighthouse is placed on the side of the hill, close to the sea, the reason for this being that fog often collects on the upper part of the island while the weather below is

*Landing material at Point A. Maurier for Station now removed to Harrington*

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*Cape Race : rough sea beating against cliff. Marconi Station at extreme right*

quite clear. According to my experience, Belle Isle is most inaptly named, for the island is certainly not beautiful, and when the wind blows a gale—which, at the top of the hill, is very frequent—and the damp fog is also included, the place is very dreary for the lightkeeper and operators. Wireless is the only means of communication except when the Government steamers call to supply the lighthouse and Marconi station and bring mails. Belle Isle is really part of Labrador, and to the south of the island the Newfoundland coast can be seen about fifteen miles off, the nearest point being Cape Bauld, on which the Newfoundland Government have a lighthouse. On the north-east point of Belle Isle there is another lighthouse, and about ten miles to the north-west of this Battle Harbour is situated, where is erected the first of a chain of wireless stations along the Labrador coast, owned by the Newfoundland Government and operated under contract by the Marconi Company, and connected with the chain of stations through the Straits of Belle Isle and Gulf of St. Lawrence, which stations are owned by the Canadian Government and operated by the Marconi Company.

The Labrador coast stations have been erected for the benefit of the Newfoundland fishermen, who go north in large numbers every year, thus enabling them to communicate with each other during the fortnightly periods of waiting for the mail steamers in summer time. They are also used by merchants in various parts of Newfoundland to communicate with their agents on the Labrador coast, there being no other telegraph available. The stations extend some 300 miles along the Labrador coast north from Battle Harbour, and are nine in number—namely, Battle Harbour, Venison Island, American Tickle, Domino, Grady, Indian Harbour, Holton, Cape Harrison and Mokkovik.

To return to our trip through the Straits of Belle Isle ; after passing the island we enter the Straits which divide the Labrador and Newfoundland coasts, and a steam of some sixty-five miles brings us to Point Amour, where there is another wireless station in addition to a lighthouse. Point Amour is on the Labrador coast, and on the opposite side of the Straits Flowers Island lighthouse can easily be seen if the weather be clear, the distance across being only nine miles. This is the narrowest part of the Straits, and is in all probability the least safe portion of the route in thick weather. A peculiarity of the fog in the Straits of Belle Isle, and also in the Gulf of St. Lawrence, is that it hangs in banks, and it is in connection with these fog banks

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*Cape Bear Station*

that the "wireless" is particularly useful as an aid to navigation. It is possible for a steamer to be at one moment in the densest fog and at the next to be in brilliantly clear weather. It frequently occurs that a steamer may be approaching Point Amour and run into a fog bank when but a short distance from this narrow part of the Straits. The Captain will send a message to the station asking for a report of the weather. Should the reply give him "clear weather" at Point Amour, he will know that it is safe for him to proceed, as he is only in a small fog bank and will get out of it before running the risk of going ashore. Had he not the means of obtaining this information he might probably be very considerably delayed, as would, of course, be the case if the fog were general. Again, icebergs frequently drift south as far as Point Amour, and notifications of such menaces to shipping, which can be given by the wireless station, are of the greatest value.

Proceeding further, Greenly Island light is passed to the starboard, and about fifty miles from Point Amour Point Rich on the Newfoundland coast is passed. The steamer does not approach very close here, but the light is usually visible, and the wireless station ready with any information required.

A run of about 240 miles from Point Amour brings the steamer off Heath Point on the Isle of Anticosti, which island is in the middle of the Gulf of St. Lawrence, and was some years ago purchased by Mr. Menier, of French chocolate fame, from the Canadian Government as a game preserve. About 120 miles to the east of Heath Point the steamer has passed, although not within visible range, the wireless station at Harrington, where Dr. Grenfell, of the Newfoundland and Labrador Deep Sea Mission, has one of his hospitals. Harrington is an island off that part of the Quebec coast which is sometimes known as the Canadian Labrador. The Heath Point station is the turning point in the Gulf, and the steamer, which has previously taken a south-westerly course, takes a westerly or north-westerly course from the lightship about fourteen miles from Heath Point, the water around Heath Point being in places very shallow and unsafe for large steamers.

From this point the steamer crosses to the Gaspé coast, sighting Fame Point, the first land of true Canadian soil to be approached. Fame Point is on the south shore of the Gulf of St. Lawrence, and has a lighthouse, fog-alarm and wireless station; this being the station through which all Canadian Government

*Cape Bear Station and Lighthouse*

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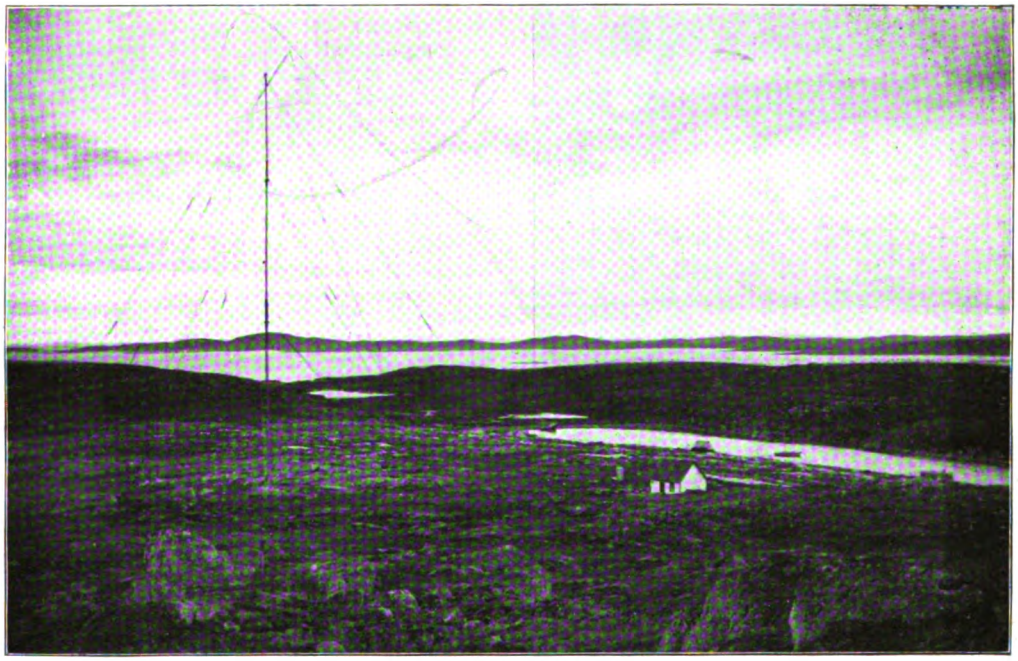

*Donuno Station, Labrador*

messages, weather reports and ship companies' messages are routed. The station has direct connection by land-line to Quebec, and for this and other reasons it is made the controlling station of the Gulf system.

There is a striking contrast between the Gaspé coast and the latter, consisting of Belle Isle, Labrador and Newfoundland coasts, chiefly of bare, bold rock; around Fame Point the Gaspé coast is a bold land of

*Fame Point, showing Station Building on left and Lighthouse and Fog Alarm on right*

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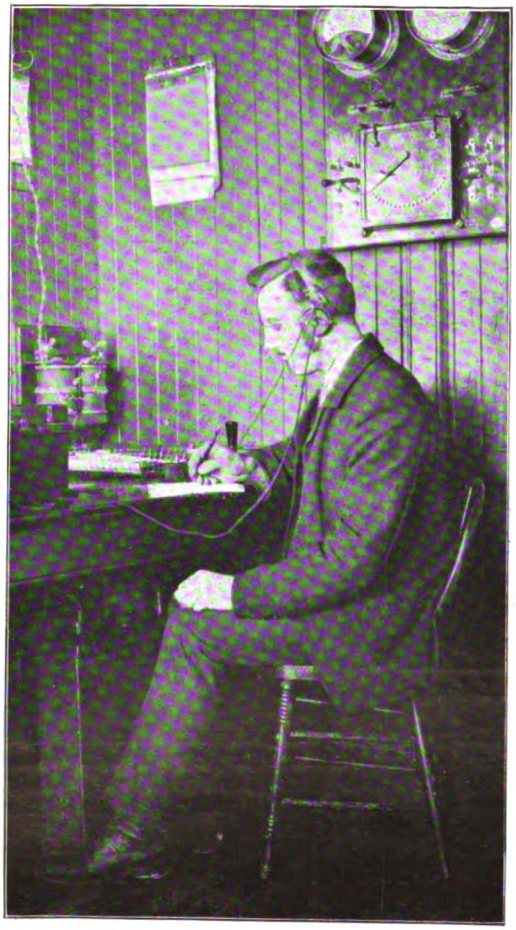

*Operator receiving Message at Point Rich*

considerable height, and densely wooded. About eighty miles west of Fame Point we pass Cape Chatte and enter the St. Lawrence River proper, for the river is said to end at Point des Monts on the north shore and Cape Chatte on the south shore and the Gulf to begin. At Cape Chatte the land is particularly high and bold, and not wooded, but as we get farther up the land becomes more undulating, the soil more fertile, the settlements more frequent, until Father Point is reached, about 160 miles from Fame Point and about 150 miles below Quebec.

Father Point is the pilot station for the St. Lawrence River, and all steamers stop and take pilots, each line of steamships engaging their own pilots. The wireless station at Father Point communicates with Clarke City on the north shore, which is about 140 miles north-east of Father Point and about 100 miles north-west of Fame Point, and is the connecting link between the Father Point and Fame Point stations, which are both on the south shore of the St. Lawrence. At Rimouski, a few miles west of Father Point, the mail steamers land their mail and then proceed to Quebec, a stop being made at Grosse Isle, thirty-two miles below Quebec, for medical inspection, and if the delay here is not long Quebec is soon reached, at which port all third-class passengers are landed. There is a wireless station at Grosse Isle for communication with Quebec, and supplying the quarantine station at Grosse Isle with information of steamers' movements, etc. Passengers intending to proceed to Montreal on the steamer should go ashore at Quebec without fail in order to see the old city, which is extremely interesting. From Quebec the steamer proceeds to Montreal with a new pilot on board. There are wireless stations at Quebec, Three Rivers (half-way between Quebec and Montreal), and Montreal, which stations are intercommunicating.

The whole trip through the Straits of Belle Isle, Gulf of St. Lawrence, and up the river as far as Montreal is at all times, but particularly in fine weather, most interesting; and when one considers that one's safety is so well provided for, that communication can be had with all parts of the world through the wireless stations, the majority of which are intercommunicating and often afford the *only* means of communication from the isolated places at which they are situated, the trip would appear quite out of the ordinary.

In the spring and late autumn, when the Straits of Belle Isle are not navigable, the steamers take the Cape Race route south of Newfoundland, communication being first established with Cape Race, which station can communicate with Cape Ray and is fitted with

*Point Amour Station and Lighthouse*

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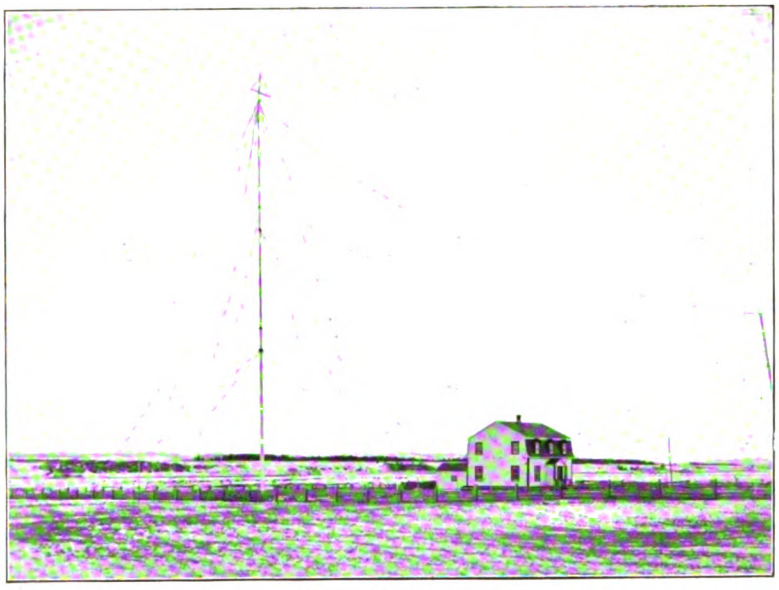
a 5-kw. set. Cape Ray is on the south-west of Newfoundland where the Cabot Straits connect the Atlantic with the Gulf of St. Lawrence. The station here communicates with Heath Point, Grindstone in the Magdalen Islands, North Sydney, Cape Race, and with Fame Point in case of emergency. Heath Point, which is the central station in the Gulf, communicates with Fame Point, Grindstone, Cape Ray, Harrington, Point Rich and Belle Isle, this latter communication being made whenever possible under clear conditions to clear traffic in order to prevent the necessity of transmitting messages from Belle Isle via Point Amour and Point Rich. The distance from Heath Point to Belle Isle is 300 miles, which two stations and the majority of the Gulf and Straits stations are fitted with 2-kw. engine-driven sets.



*Father Point Station*

The stations from Father Point through Clarke City, Fame Point, Heath Point, Harrington, Point Rich, Point Amour, Belle Isle and along the Labrador coast to Cape Harrison, form an unbroken chain of seventeen intercommunicating stations. Other branches allow of communication between all these stations and Cape Ray, Cape Race, North Sydney, Grindstone, Cape Bear in Prince Edward Island, and Pictou in Nova Scotia, the latter two stations being principally used for communication with ice-breakers navigating the Northumberland Straits in winter. In addition to the above-mentioned stations, one has just been erected at Fogo, about 150 miles south of Belle Isle on the east coast of Newfoundland, which station is for the purpose of communicating with the sealing fleet in the spring and for clearing the Labrador traffic and private steamer traffic through Belle Isle, instead of passing same down through the Gulf via Heath Point and Cape Ray as in former years.

Within the Labrador, Newfoundland, Straits of Belle Isle, River and Gulf of St. Lawrence stations up to Father Point there is a system of twenty-four intercommunicating stations, forming one of the finest systems in the world; and, considering that it is intended shortly to establish communication between Father Point and Quebec, this number of stations will be increased to twenty-eight.

*Point Rich Station. Dogs employed for hunting materials used in construction*

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# The Work of the Post Office

THERE is probably no institution existing in the country which comes so near to the hearts and homes of the British people as the General Post Office. This vast organisation has become an indispensable social and commercial necessity, and it requires no exceptionally vivid imagination to invest with human interest the formidable rows of figures appearing in the annual reports of the Postmaster-General which reflect the manifold activities of the department over which he presides. Not many years ago, the statement that before long it might be possible to transmit and receive marconigrams to and from ships at sea would have been regarded with incredulity, but within recent years the developments in the Post Office have been enormous, and its activities form a striking contrast to the earlier days of this great institution.

It requires almost an effort to remember that the origin of the Post Office was quite as much a matter of police as it was to serve a commercial convenience. It was instituted under Cromwell's Government, and the Act of the Commonwealth which created it states that it was to be " for the benefit of commerce, for the convenience of despatches, and for the discovery of wicked and dangerous designs against the Commonwealth." The service with which our forefathers were more or less contented is well summarised in a spirited description in Cowper's *Task* of the arrival of the mail in the seventeenth century :

Hark, 'tis the twanging horn ! O'er yonder bridge,
That with its wearisome but needful length
Bestrides the wintry flood, in which the moon
Sees her unwrinkled face reflected bright,
He comes the herald of a noisy world,
With spattered boots, strapped waist and frozen locks,
News from all nations lumbering at his back.
True to his charge, the close-packed load behind,
Yet careless what he brings, his one concern
Is to conduct it to the destined inn,
And having dropped the expected bag, pass on.

Late in the eighteenth century, however, the Post Office bestirred itself, and the postboy period, to which Cowper's lines apply so admirably, gave way to the more efficient travelling capacities and requirements of the time.

The work of the Post Office during 1911-12 furnishes striking testimony to the wide range covered. One feature which stands out in the latest annual report is the steady increase in the number of marconigrams dealt with at the Post Office coast stations—the outward messages to ships reaching a total of 6,680 during the year, as compared with 5,640 in 1910-11 ; the inward marconigrams from ships being 37,827 as compared with 34,161 in 1910-11. These figures represent an increase of 11·8 per cent. over the preceding year. But what is more striking is not so much the actual increase, but the enormous field for future business which awaits cultivation, for immediately the general public are made sufficiently familiar with the cheap and easy facilities that exist for communicating with their friends at sea over long or short distances there will be an enormous increase in the amount of traffic through Post Office stations. This class of communication must appeal with double force to commercial men, who by means of wireless telegraphy are able to transact important business affairs while on the high seas at extremely low cost.

### P.O. Wireless Stations

The Post Office stations at present open for general correspondence with ships at sea are as follows : Cullercoats (Northumberland), Caister (Norfolk), North Foreland (Kent), Niton (Isle of Wight), Bolt Head (Devonshire), Lizard (Cornwall), Seaforth (Liverpool), Rosslare (Wexford), Crookhaven (Cork), and Malin Head (Donegal). In addition to these there are the long-distance stations of the Marconi Company at Clifden in Ireland and Poldhu in Cornwall. The Cullercoats station was purchased by the Post Office in March, 1912, and its transfer marks the first step in the reorganisation of the coast station, in respect to which an expenditure of £16,000 was authorised last year.

The report draws attention to the announcement which was published during the early part of 1912, that telegrams for the United States and Canada are now accepted at all postal telegraph offices for transmission by the Marconi Company's wireless telegraph service between Clifden in Ireland and Glace Bay in Canada. The charge is 4d. per word less than the cable rate for ordinary telegrams, and 2d. less than the half-cable rate for deferred telegrams. That these reductions are appreciated by the public is evidence of the popularity of the Marconi Transatlantic Service, and of its efficiency.

During the past year 153 new licences, covering 202 new land stations, were granted in the United Kingdom under the Wireless Telegraphy Act. On March 31st last there were in existence 8 licences for the purpose of private business, excluding installations on Trinity House lightships and 258 licences for the purpose of experiment.

There are many other features of this report that might be worth noticing, but we must content ourselves for the present with this brief reference to the section devoted to wireless telegraphy.

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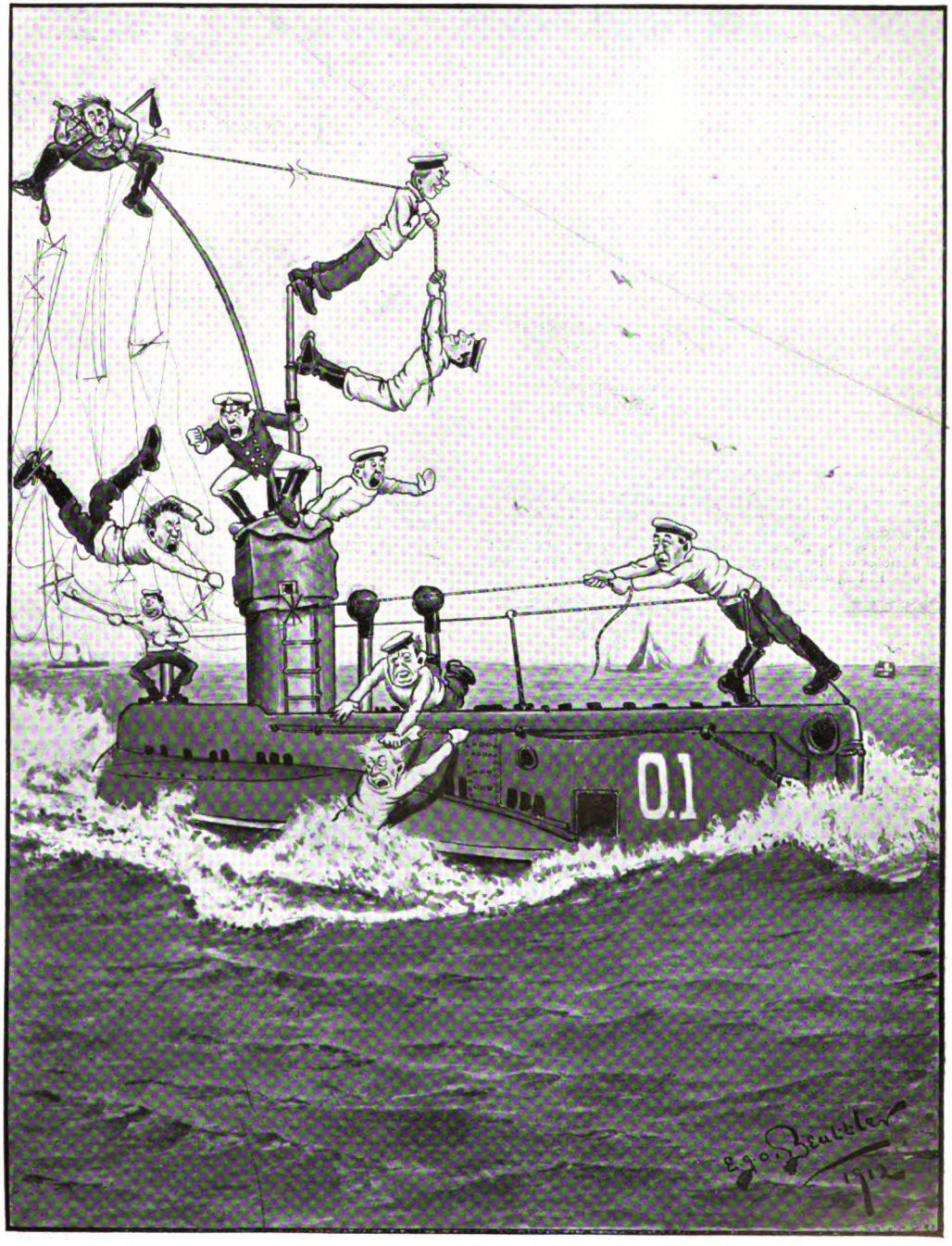


FITTING UP A SUBMARINE WITH WIRELESS

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THE MARCONIGRAPH

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The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

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### The Share Market

London: December 23rd, 1912.

A considerable fall has taken place in the market prices of the various issues of the Marconi Companies during the past month. A circular was issued by the Company to allay any uneasiness in the minds of the shareholders regarding the position of these undertakings. This circular made it quite clear that their prospects have in no wise been jeopardised or weakened by any recent developments, but that on the contrary, the success of these concerns is proceeding steadily. The market prices have hardened up very considerably, and closed on December 23rd: Ordinary, $4\frac{9}{16}$; Preference, $3\frac{5}{16}$; Canadian, 18s.; Spanish, $1\frac{1}{16}$; American, $1\frac{3}{16}$.

### The Spark System and Continuous Waves.

The following statement was issued by Marconi's Wireless Telegraph Co., Ltd., on December 14th, 1912:

"Mr. Marconi has recently returned to London, and has become acquainted with the statements which have been made in recent weeks, and with the opinions which have been expressed that continuous waves would in the future supersede the spark system.

"As these statements and opinions are liable to mislead shareholders and cause them some uneasiness, I am instructed to inform you that Mr. Marconi himself tested continuous wave systems many years ago, and experimented with them during the greater part of 1907 at the Poldhu station. As a result of these experiments he learned the advantages and disadvantages pertaining to continuous waves, and eventually arrived at a compromise between the continuous wave and spark systems, combining the best points of both. This resulted in material changes in his system for long distance work, and new and important improvements were patented by him in 1907, which are mainly responsible for the progress since made in long-distance wireless telegraphy.

"These inventions, which materially modify the spark system, seem to be surprisingly little known, notwithstanding the lectures delivered by Mr. Marconi at the Royal Institution of Great Britain on March 13th, 1908, and June 2nd, 1911, the Nobel Prize Lecture at Stockholm in 1909, and the address to the New York Electrical Society on April 17th, 1912, when he made statements relating to the use he was making of continuous waves, semi-continuous waves, and the elimination of the spark.

"By Order of the Board,
"HENRY W. ALLEN, *Secretary*."

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# The Imperial Wireless Scheme

## Proceedings before the Select Committee

THE Select Committee of the House of Commons, inquiring into the contract by the Post Office with Marconi's Wireless Telegraph Co., Ltd., adjourned for a brief vacation on December 19th, 1912, after holding twenty-two meetings. The first ten of these were reported in the December number of this magazine; since then the greater portion of the time has been occupied in hearing evidence from representatives of various Government departments. This evidence was interrupted by Mr. Beach Thompson, the President of the Federal Telegraph Company of America, who again presented himself in the witness chair on November 25th and 27th, and read messages received by him from America, bearing on the question of communication by the Poulsen system. The messages purported to have been sent in each case by H. P. Veeder, Secretary of the Federal Telegraph Company, from San Francisco, on dates between November 16th and November 22nd, and they stated that communication had been established with Honolulu. Thereupon, Lord Robert Cecil read the following letter which had been sent to Sir Albert Spicer, Chairman of the Committee, by Mr. Godfrey C. Isaacs, managing director of Marconi's Wireless Telegraph Co.

"I propose to give evidence at a later stage respecting the statements made by Mr. Beach Thompson on Monday [November 25th], and to place before the Committee telegrams and affidavits with respect thereto. In the meantime, I think it may be of some assistance to you to have transcribed copies of the telegrams received by me on the 21st inst. [November], and this morning [November 27th]."

TELEGRAM FROM NEW YORK 21ST NOVEMBER, 1912. "GINMAN LISTENING POULSEN COMPANY DEMONSTRATION BRITISH CONSUL REPORTS 11.33 A.M. WEDNESDAY. FRISCO SAYS: '*This 42 kw. 60 volts 70 amp. more than used any time yesterday, your signals are weak too, not anything like so good as yesterday must keep in communication somehow stop.*' 12.14 P.M. FRISCO SAYS: '*Beach in, killed you: did you get three and four: in case lose you stand by, will send blind for demonstration provide cannot hear you stop.*' 12.27 P.M. FRISCO SAYS: '*Demonstration now here are you ready have beach out now stop.*' 12.47 P.M.: '*Stand by, we will have message few minutes: just stand by stop.*' 1.0 P.M. WEDNESDAY: '*Frisco sends thirty-three words code messages Consul Honolulu repeating each word twice stop.*' 1.37 P.M.: '*Frisco evidently repeating from Honolulu asks repetition text words stop.*' 1.42 P.M. FRISCO SAYS: '*Did you get your O.K. to our three and four send them again.*' 2.27 P.M. FRISCO SAYS: '*Beach came in killed you stop.*' 1.0 P.M. (?) WEDNESDAY, FRISCO SAYS: '*Nothing doing beach was in.*' 3.15 P.M.: '*Ditto stop.*'"

"That," continued Lord Robert Cecil, "is the end of the quotations from what was going on as I understand it in the Poulsen Company: and then comes this:

*'Ginman sent three word code messages Sawler via Federal compared cable tranmission occupied one hour and fifty minutes reply received by Federal Company five hours later: transmission and reception checked logs affidavits mailed Frisco stop. Our system"* [*Marconi*] *"Received message from steamer 'Wilhelmina' using standard 2 kw. 615 miles day stop. Communication has been established Cape Cod Santa Marta nightly with 35 kilowatts stop."*

Mr. Beach Thompson was examined in great detail by Mr. Booth as to the finances of the American Poulsen companies. He explained that there were two companies in America, one of which he called an "operating company," and the other a "holding company." They had not published balance-sheets or prospectuses. The entire management of the company was in the hands of three trustees, and the shareholders had delegated their powers to these trustees. Asked whether he was prepared to take a contract with the British Empire for stations, he replied that the American company was not prepared to do so.

Referring to the letter which the witness had sent to the chairman of the Committee, Mr. Booth asked whether the capital of £5,000,000 was subscribed or not. Mr. Beach

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Thompson replied that it was the nominal capital; he declined to say how much was subscribed. He added: I do not care to go into any of those questions; you are only wasting time.

The Chairman: May I remind you that you have voluntarily given us those figures, and therefore any member of the Committee has a perfect right to ask questions on them?

Mr. Booth: You say 75 per cent. of the stock is pooled. Do you mean the subscribed capital is pooled, or the nominal capital is pooled?—Seventy-five per cent. of the nominal capital is pooled.

How can you pool stock that has not been taken up or subscribed?—That is a question for the attorney.

Is there scrip for it?—It is all either in the hands of subscribers or trustees. It is issued as fully-paid stock. By that I do not mean to convey that we have paid cash to the full amount.

Mr. Thompson was next questioned regarding his relations with Mr. Carl Philip. In his letter to the chairman, Mr. Thompson stated that Mr. Philip came to him at the Savoy Hotel some time in October, and said that he had an offer from a brokerage house for a large block of stock. The price mentioned was $30 per share, and he (Mr. Philip) said he would sell his stock. He said that he thought the party which was buying was the Marconi Company, and that he was going to see Mr. Isaacs. In reply to Mr. Booth, he admitted that Mr. Philip was a director of the company, and represented the Danish interests on the Board. They travelled together on the same steamer, but he said it was by accident that they met there, and during the voyage "they never mentioned business."

Mr. H. A. Madge, the Admiralty wireless expert on H.M.S. "Vernon," was examined at considerable length by various members of the Committee. In reply to Lord Robert Cecil, he expressed the opinion that, from a technical point of view, the company would make a better job of the work than the Admiralty would. Referring to the designs submitted by the Marconi Company, Mr. Madge expressed his opinion that everything he had seen throughout showed thoroughly sound engineering, and in every case the designs seemed to be amply well thought out and convenient. He felt that the Marconi Company had got experience, and most valuable experience; that in entrusting the stations to them the Government were making certain of having available a staff—and a large staff—and a staff that had been working on long-distance work for some time. He felt that most of the parts that were to be used were the result of experience, and many of the particular pieces of apparatus would be possible standards that had been in use elsewhere, and it was probable that they had been well tested. Taking the design in a general way, it was a design about which there should be a certainty that it was sound and thorough. In reply to further questions, he thought that the main outline of the scheme and installation was sound, and not only the details, but the way they were worked out by men of experience and brains who were experts.

The Marconi system had been proved. It was a system that was well developed. It was not new. It had been well worked out, and had arrived at a well-developed stage—well beyond the experimental stage as far as the main principles of the system were concerned. He had never seen the high-speed apparatus of the Marconi Company, but he had a general idea of the methods that would be used to obtain duplex working, and there seemed every possibility and probability, and every likelihood, that the system would be satisfactory. It was a disadvantage in regard to the Poulsen system that it was in its infancy, and there was not the same experience in regard to it. The Marconi Company's staff had the experience of putting up long-distance stations at Coltano, Poldhu, Clifden, Glace Bay, and elsewhere. They had also erected a very large number of smaller stations. In the case of the Marconi system there was a greater certainty and a greater probability of things going through without a hitch.

Lieut. Raymond Fitzmaurice, who was formerly in the Naval Ordnance Department of the Admiralty, and who is now employed on Aeronautical Wireless Telegraphy, asserted that if he got a communication from the Committee of Imperial Defence that this scheme should be carried through at the earliest possible date, he would go to the company that was doing the work.

Capt. E. F. B. Charlton, Assistant-Director of Torpedoes at the Admiralty, explained that his position carried with it the responsibilities in all matters connected with the design, working, and development of wireless telegraphy at the Admiralty. All the experience which the Admiralty had of high-power stations was at Malta and at Gibraltar, but these stations were not quite so powerful as those which will be put up in the Imperial chain. It was necessary that the Admiralty should keep their experimental party going at full strength, which they would be unable to do if they undertook the contract. The final agreement appeared to him to be a good commercial working agreement. He said that the matter was urgent and pressing, and it was unfortunate that this country had been talking so long about this scheme. The Admiralty were in possession of information in regard to the pro-

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ceedings of other nations in the matter of wireless chains, and while we were inquiring and debating and talking about the matter, which had been described as vitally essential from the Admiralty and War Office point of view, other nations were going on. Capt. Charlton was then asked whether he was prepared to agree, after all the questions had been put to him since he made the statement, that this agreement was a good commercial agreement. He replied in the affirmative.

Mr. Percy Minter, Assistant Director of Naval Contracts, next occupied the witness chair. He informed the Committee that he could speak only as regards the business side of the agreement as far as the Admiralty was concerned with it. The terms and conditions were understood by the Admiralty to be exceptionally good, and the best which the General Post Office, after strenuous negotiations, had found it possible to induce the Marconi Company to accept. The agreement represented a settlement which the Admiralty concurred in as being preferable to the only alternative at the time available—viz., the erection of the stations by the Admiralty. Mr. Minter then made some observations with a view of showing that there appeared to him to have been very strong grounds for giving the contract to the Marconi Company; and in justification to its terms, one of the points that occurred to him was the experience of the company, for the Government were obtaining not only the use of the patents, but also the company's experience. Even though the Government might have the power to use the Marconi patents, under the terms of the Crown Clause in the Patents Act, it could not have the right to their co-operation without coming to terms. He was not certain that the Crown Clause in the Patents Acts really applied to this case. That clause gave the Government power to use patents, but for the purpose of the Crown. It appeared to him open to doubt whether the use of these stations for commercial messages or general public messages amounted to a user for the service of the Crown.

Mr. Minter was asked whether, from his position as Assistant Director of Naval Contracts, he thought, in its present state, it was a fair business agreement. He replied that, assuming the terms were the best that the Marconi Company would accept—and he had no reason to doubt that it was so—he could not see that there was anything better that the Government could have done. Questioned with regard to the point mentioned as to the application of the Crown Clause in the Patents Act, under which the Government were entitled to use patents on payment of a sum to be fixed by arbitration, he pointed out that that Clause only applied to the United Kingdom, and it would therefore be doubtful whether they could erect the six stations which were proposed and to get the right to use the patents upon arbitration terms with regard to all the stations. The Admiralty had an agreement with the Marconi Company, under which they were paying the company a royalty for the use of the company's patents.

Capt. Maurice FitzMaurice was asked to give evidence because he was a member of the Cables Landing Rights Committee, and also a member of the Imperial Wireless Telegraph Committee. He was of opinion that the cables were likely, at some future time, to be entirely superseded by wireless. A further reason for prompt action lay in the fact that so long ago as March 1910 the Marconi Company offered to establish a chain of long-distance stations throughout the Empire without any subsidy, and to give the public the benefit of a substantial reduction of rates. The company had for some time been pressing for a decision in the matter. The Marconi Company had established the only commercial long-distance service at present in operation. They stood in a very strong position, and their co-operation was almost essential if an Imperial scheme was to be carried out. The Admiralty would find it difficult to erect the stations, and would only do so in the very last resort.

The next witness was Colonel G. M. W. Macdonogh from the War Office, who supported the Admiralty evidence as to the necessity for proceeding with the scheme without delay. If the Admiralty had undertaken to erect the stations, they would be almost forced to get assistance from the Marconi Company. The War Office were making use of Marconi patents, but not under any agreement with them; in fact, they were in correspondence at the present time with the Marconi Company with regard to the War Office making use of the company's patents without their authority. He was of opinion that the Marconi Company was the only company which had the experience of which the Government stood in need.

Major Boys, who represented the department of the War Office which deals with wireless telegraph equipment, agreed with the description of the attitude of the War Office towards the agreement given by Colonel Macdonogh.

On December 9th Mr. J. E. Taylor, a staff engineer attached to the Engineer-in-Chief's Department at the General Post Office, who is in charge of the technical section controlling applications of wireless telegraphy under the Post Office administration, presented a long technical statement, which it is impossible to summarise adequately in the space at our

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disposal. He was followed by Commander F. G. Loring, Inspector of Wireless Telegraphy to the General Post Office, who before giving evidence read the following telegram which the Secretary of the Post Office had received from the Foreign Office. This telegram was from Consul-General Ross, at San Francisco :

"December 10th, 1912. Paraphrase of telegram received from Consul-General Ross (San Francisco). My telegram of December 2nd. The Federal Company here will not permit me to make the test respecting which you telegraphed to me on November 30th. I have just received a telegram from the company which runs as follows : 'Following from manager of company, December 7th, Paris. The President must refuse to give any further information unless official request is made to him personally by the Committee. Moreover, it would not be in order until February. The testimony given by me before the Committee was taken out by order by consent.' "

Commander Loring expressed the opinion that even if they did get a demonstration of the Poulsen system, such as they had received now—that is, a demonstration of a single exchange between two stations—before they could have accepted the Poulsen tender they would have had to go very thoroughly into the working of the company, and prove that communication could be maintained not over a day, or week, or month, but over a very considerable period. He was convinced that it would be exceedingly risky to take on anyone for this job whose system was not properly tested and tried. The Admiralty were "not a truly effective competitor, because they had never actually done the thing," and he thought it was one reason why they had thought twice about undertaking the scheme. He was of opinion that the only contractor possible was the Marconi Company. It was put to witness by Lord Robert Cecil that if the agreement confers a virtual monopoly on the Marconi Company, it would be a serious obstacle to adopting the continuous wave system when it does come. Commander Loring asked why anybody should assume that because the Marconi Company in the year 1912 were using the spark system. The continuous wave was not particular to anybody, and was not a patent. It was a method of production. Why should not the Marconi Company adopt the continuous wave, if it was going to be better ? He could not understand such a point. He thought Mr. Marconi was in advance of the times. He had this circuit across the Atlantic to experiment with, and he had a great advantage in that he could put up the stations and had been experimenting for some years.

The Right Hon. Sir George Reid, High Commissioner for the Commonwealth of Australia, gave evidence on December 12th, and he was followed by Sir Richard Solomon, the High Commissioner in London for South Africa. Then Mr. Crompton Llewelyn-Davies, a solicitor to the Post Office, gave evidence in regard to the legal aspects of the agreement, and Mr. E. W. Farnall, one of the assistant secretaries, gave evidence regarding certain interviews. In the course of his examination Mr. Farnall was asked whether he had heard statements by the Poulsen people to the effect that they were confident they could do the work. According to the records of Mr. Farnall's department, the statement was made as far back as 1907 that the Poulsen Company "had absolutely no doubt of being able to establish a thoroughly satisfactory service with America." He added that the statement was then made that the Poulsen engineers had succeeded with a transportable station which the company had recently supplied to the German Government in establishing communication between Berlin and Cambridge in both directions. The Poulsen people were saying in 1912 what they said five years ago.

He was then asked whether as a business man, and having representations made to him that this was a matter to be put in hand at once, and having regard to the fact that it was five years ago that such a statement was made, would he think it a wise and reasonable thing to give a contract to those people now. Mr. Farnall replied "Most certainly not." Mr. Redmond drew witness's attention to the statement that the Poulsen Company had recently supplied to the German Government, and had established thoroughly satisfactory communication between Berlin and Cambridge with a transportable station, and he asked witness whether he knew of any such communication as that existing now. Mr. Farnall replied : "No—and I do not believe it ever existed." He added that they had never heard at the Post Office of any direct communication by the Poulsen Company between Berlin and Cambridge.

Mr. Roland Wilkins followed Mr. Farnall in the witness chair. Mr. Roland Wilkins is principal clerk in charge of the division of the Treasury which deals with the Post Office, etc. On December 18th and 19th evidence was given by Sir Henry Norman, who gave an account of the development of wireless telegraphy, the advance in which in recent years had, he said, been amazing, thanks largely to the work of Mr. Marconi, who had done more than any man living to adapt scientific wireless to the practical use of mankind. After hearing Sir G. Croydon Marks, the Committee adjourned till January 1st.

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## Parliamentary News

SITES FOR WIRELESS STATIONS.—Asked by Major Archer-Shee why the Commission, which had been appointed to select sites for the Imperial wireless scheme, had not been sent out, Mr. Herbert Samuel replied that the whole question of the establishment of Imperial wireless stations being under the consideration of a Committee of the House, it was not thought proper to incur the expense involved by the despatch of the Commission until the report has been received.

"But," said the Major, "the selection and purchase of sites and the erection of buildings are matters not before the Marconi Committee. Why have the Government delayed taking any steps?" Mr. Samuel tried to satisfy his interrogator by pointing out that it would be disrespectful to the Committee if he took any steps. Besides, what would happen if the Committee might recommend suspension of the whole scheme!

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MARCONI WIRELESS RIGHTS.—Major Archer-Shee has been somewhat perturbed by the agreement between the Marconi Wireless Telegraph Company of Canada and the Newfoundland Government, and this prompted him to ask the Postmaster-General on December 19th for further information regarding this agreement. He wanted to know whether exclusive rights for wireless telegraphy stations had been granted to the company until 1926; whether this referred to Transatlantic wireless stations, and, if so, what action His Majesty's Government proposed to take to prevent a monopoly of wireless communication across the Atlantic being set up by the Marconi Company.

Captain Norton, who gave a written reply to this question on behalf of the Post Office, said that he understood that the Newfoundland Government had entered into an agreement with the Marconi Wireless Telegraph Company of Canada granting rights existing till 1926 for the erection of stations in Newfoundland. The Postmaster-General, not having seen a copy of the agreement, he was not in a position to say whether it conferred a monopoly for the erection of long-distance installations.

* * *

FRIABLE LAND LINES.—A great deal of inconvenience is felt in the North of Scotland owing to breakages of telegraph land lines, and the line between Mull, Coll, and Tiree has been down since November 22nd. When questioned about it in the House of Commons, the Postmaster-General said he was making careful inquiries into the suggestion of a wireless service between Tiree and the mainland in consequence of the frequent telegraphic breakdowns.

* * *

WIRELESS STATIONS IN EAST AFRICA.—A question put to the Colonial Secretary by Sir Hildred Carlile elicited from Mr. L. Harcourt the information that the cost of the high-power station proposed to be erected under the Imperial wireless scheme in the highlands of East Africa will be borne by the Home Government. It is also proposed to erect a low-power station at Mombasa, the cost of which will be a charge upon the revenues of the East Africa Protectorate.

* * *

THE IMPERIAL SCHEME.—On November 25th Major Archer-Shee asked the Postmaster-General whether he had any further statement to make with reference to the attitude of the Governments of New Zealand, Canada and Newfoundland towards the agreement with the Marconi Company. Mr. Herbert Samuel replied there had been no question of establishing at the present time a Transatlantic service as part of the State-owned Imperial wireless system. The participation of the Governments of Canada and Newfoundland was therefore not invited or discussed. The Government of New Zealand had entered into arrangements, before the negotiations with the Marconi Company began, for the erection of a station capable of communicating with Australia, a distance of about 1,100 miles.

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A wireless communication was received on December 6th last by the naval authorities at Queenstown from the captain of the Booth Line's "Hilary," of Liverpool, stating that the vessel had passed on December 5th, at 1.30 p.m., in lat. 46.29 north, long. 6.53 west, a derelict wooden vessel whose hull stood about 12 feet out of the water. The ship did not seem to have been long abandoned. The captain reported that the derelict was right in the track of Transatlantic liners, and therefore most dangerous to navigation, especially at night.

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## Canadian Notes

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The efficiency of the wireless set surely will not remain for ever at 20 per cent., and variation will continually be introduced as the apparatus improves. If a law is to be established, rigid adherence must result, and conformity must not depend upon assumed efficiencies and any particular light source chosen.

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*December 5th*, 1912.

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## Reviews of Books

"HISTORICAL AND ECONOMICAL GEOGRAPHIES," by Horace Piggott and P. J. Finch. (London: J. M. Dent & Sons, Ltd. Book I. 390 pp.)

A geography that makes the study of the earth a reasonable and vital science is always to be welcomed; but thrice welcome is a book which aims at showing the practical application of the study, its influence on human development, and its relation to human affairs. On such principles the authors of the book under notice have based their work, and they are to be congratulated on a production which contains not a single dull page. Only the first volume has, however, been published, but as it is introductory to the remainder of the series, it is possible to gather the full scope of the work, and certainly the authors have extended their views far beyond the range of the average geographer, and have called in the aid of geology, archæology, history, and kindred sciences, in order to demonstrate the relationship of this study to human affairs. It is rarely that we find such matters as the need for communication between city and city—continent and continent—dealt with in a book of this character; but this subject has proved an important branch in the making of the world's geography, and it is therefore pleasant to read a chapter on communication in this introductory volume of Dent's Geography. Railways, shipping, telegraphic and telephonic communication are all admirably dealt with considering the small space available for this one among so many complex interests; and we note with particular satisfaction a reference to wireless telegraphy. There are two maps, one showing some of the Trans-Atlantic stations operated by the Marconi Company, and another the stations which it is proposed to erect for the Imperial chain.

"TRADLÖS TELEGRAFI," by Thor Thörnblad. (Stockholm: P. A. Norstedt & Söners Förlad. In parts, 2 kronor each.)

From Sweden comes an interesting work on wireless telegraphy which is introduced with a "foreword" by Prof. Ivar Fredholm, the distinguished professor of mathematics and physics at the Stockholm University. Lieut. Thörnblad has treated his subject exhaustively, but the work will not lose in interest for the general reader on this account, and it should be of great assistance to those who are concerned with questions of wireless telegraphy. It is issued in parts: the first part containing a history of the subject. In parts II. and III. the physical problems are discussed, and the various systems are described in the succeeding numbers. Part VIII. is the latest to be issued, and we look forward to the completion of the volume with much interest.

## Some Works of Reference

WHITAKER'S ALMANAC FOR 1913 contains a careful and accurate summary of useful information concerning every subject of interest, which makes the book invaluable for every business man's office as well as for every student's library.

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The INTERNATIONAL WHITAKER is a new work which will undoubtedly be invaluable as a companion to WHITAKER'S ALMANACK. Hitherto there has been no compendium of information in regard to foreign nations at a popular price. In 500 closely printed pages is contained a detailed account of the financial, social and military affairs of each nation, with British and American diplomatic and consular representatives in foreign countries. The foreign facts are ranged under such headings as population, history, government, defence, finance, industries, trade, currency and others.

* * *

WHITAKER'S PEERAGE has now added a further sixteen pages to its size, and its 850 pages of information about the British nobility is a surprisingly cheap five shillingsworth. In addition to the brief biographies of peers, baronets and knights, it contains, as usual, many pages explaining to the curious or the careless the intricacies of descent and the niceties of etiquette.

* * *

Our old friend HAZELL'S ANNUAL turns up as usual to present us with a connected story of the events of the past year and a guide to the questions likely to come to the fore in 1913. The story of the Balkan War is brought down to the armistice of Tchataldja, and is illustrated by a map which has the advantage of having been drawn after the victorious progress of the allied armies, and of showing, therefore, all the place-names mentioned in the narrative. Maps illustrate also special articles on the Marconi Agreement, the Panama Canal, and the proposed Trans-Persian Railway to India. Our naval and military forces and the forces of the Dominions are dealt with at length, and are lucidly compared with those of foreign countries. The points of the political, social and religious movements of the day are presented with a clearness which renders them intelligible to anyone, while the interests of scientific, artistic, literary and sporting tastes are catered for as fully as usual. Some idea of the extraordinary extent and variety of the information compressed into this indispensable volume may be conveyed by the statement that its index fills 34 pages and contains about 7,000 references.

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## Contract News

The ITALIAN GOVERNMENT have ordered two further 1½-kw. Marconi portable cart sets.

The CHILIAN GOVERNMENT have instructed the Marconi Company to equip six destroyers and transports, now in course of construction, with 1½-kw. ship sets.

Six new vessels of the RUSSIAN VOLUNTEER FLEET are to be equipped with standard 1½-kw. Marconi apparatus. The volunteer fleet was originally raised by voluntary subscription, and it helps to form the reserve forces of the Russian Navy. In times of peace the vessels are engaged in carrying on a regular trading service, principally to the Far East. The officers are for the most part Naval Reserve Men.

A submarine now building for the NORWEGIAN GOVERNMENT will be fitted with a ½-kw. set.

A ½-kw. Marconi apparatus is to be installed on a tug intended for use in Table Bay, and belonging to the SOUTH AFRICAN GOVERNMENT.

The Compagnie de Télégraphie Sans Fil of Brussels have received orders for fitting the following vessels :

"Viking" for the SVITZER SALVAGE COMPANY OF COPENHAGEN, with a ½-kw. set and emergency gear.

"Christianiafjord" and "Bergensfjord," which are now being built for the NORSKE AMERIKA LINE, will be fitted with Marconi apparatus.

"Reina Victoria Eugenia" and "Infanta Isabel de Borbon" will be fitted with 5-kw. Marconi set and emergency gear for the CIA. TRANSATLANTICA ESPANOLA. One of the steamers is now being built at Messrs. Denny Bros.' yard, Dumbarton, and the other at Messrs. Swan, Hunter and Wigham Richardson's, Newcastle-on-Tyne.

**The following Vessels have been equipped with Marconi Installations during the past month.**

| Owners. | Name of Vessel. | Installation. | Service. |
|---|---|---|---|
| Ellerman Line ... ... | s.s. "City of Lahore" | 1½ kw. and emergency set | Passenger between England and India via Suez Canal |
| ,, ,, ... ... | s.s. "City of Calcutta" | 1½ kw. and emergency set | Passenger between England and India via Suez Canal |
| ,, ,, ... ... | s.s. "City of Birmingham" | 1½ kw. and emergency set | Passenger between England and India via Suez Canal |
| ,, ,, ... ... | s.s. "City of Paris" | 1½ kw. and emergency set | Passenger between England and India via Suez Canal |
| ,, ,, ... ... | s.s. "City of Dunkirk" | ½ kw. and emergency set | Cargo vessel between England and India |
| ,, ,, ... ... | s.s. "City of Naples" | ½ kw. and emergency set | Cargo vessel between England and India |
| ,, ,, ... ... | s.s. "City of Bristol" | ½ kw. and emergency set | Cargo vessel between England and India |
| (This is a portion of the order for equipping fifty vessels.) | | | |
| Atlantic Transport Co. ... | s.s. "Minnetonka" | 1½ kw. and emergency set (refitted) | Passenger between Tilbury and New York |
| Elder Dempster ... ... | s.s. "Abosso" ... | 1½ kw. and emergency set | Passenger between Liverpool and Lagos |
| P. & O. Steam Navigation Co. | s.s. "Borneo" ... | 1½ kw. and emergency set | Intermediate passenger boat running between London and Calcutta |
| ,, ,, ,, | s.s. "Namur" ... | 1½ kw. and emergency set | Intermediate passenger boat running between London and Yokohama |
| Tyser Line ... ... ... | s.s. "Hawkes Bay" | 1½ kw. and emergency set | Cargo vessel destined for the East |
| British India Steam Navigation Co. | s.s. "Edavana" ... | 1½ kw. and emergency set | Passenger travelling between Calcutta, Rangoon, and the Straits |
| ,, ,, ,, | s.s. "Tara" ... | 1½ kw. and emergency set | Passenger travelling between Calcutta, Rangoon, and the Straits |
| ,, ,, ,, | s.s. "Thongwa" ... | 1½ kw. and emergency set | Passenger travelling between Calcutta, Rangoon, and the Straits |
| Anglo-American Oil Co. ... | s.s. "Delaware" ... | ½ kw. and emergency set | Cargo vessel between Baltimore, Philadelphia and New York |
| ,, ,, ,, ... | s.s. "Appalachee" | ½ kw. and emergency set | Cargo vessel between Baltimore, Philadelphia and New York |
| Mexican Petroleum Co. ... | s.s. "Herbert G. Wylie" | ½ kw. and emergency set | Oil transport between Mexico and United States |

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**Orders have been received by the Marconi Co., Ltd., to equip the following Vessels with Wireless Installations.**

| Owners. | Name of Vessel. | Installation. | Service. |
|---|---|---|---|
| The Nelson Line ... ... | s.s. "Highland Brae" | 1½ kw. and emergency set | Cargo vessel carrying limited number of passengers between London and Buenos Ayres |
| " " ... ... | s.s. "Highland Glen" | 1½ kw. and emergency set | Cargo vessel carrying limited number of passengers between London and Buenos Ayres |
| " " ... ... | s.s. "Highland Loch" | 1½ kw. and emergency set | Cargo vessel carrying limited number of passengers between London and Buenos Ayres |
| " " ... ... | ss. "Highland Pride" | 1½ kw. and emergency set | Cargo vessel carrying limited number of passengers between London and Buenos Ayres |
| " " ... ... | s.s "Highland Rover" | 1½ kw. and emergency set | Cargo vessel carrying limited number of passengers between London and Buenos Ayres |
| " " ... ... | s.s. "Highland Corrie" | 1½ kw. and emergency set | Cargo vessel carrying limited number of passengers between London and Buenos Ayres |
| " " ... ... | s.s. "Highland Piper" | 1½ kw. and emergency set | Cargo vessel carrying limited number of passengers between London and Buenos Ayres |
| " " ... ... | s.s. "Highland Laddie" | 1½ kw. and emergency set | Cargo vessel carrying limited number of passengers between London and Buenos Ayres |
| " " ... ... | s.s. "Highland Warrior" | 1½ kw. and emergency set | Cargo vessel carrying limited number of passengers between London and Buenos Ayres |
| " " ... ... | s.s. "Highland Scot" | 1½ kw. and emergency set | Cargo vessel carrying limited number of passengers between London and Buenos Ayres |
| A. Holt & Co. ... ... | s.s. "Nestor" ... | 1½ kw. and emergency set | Passenger between Glasgow and Sydney, N.S.W. |
| " " ... ... | s.s. "Ulysses" ... | 1½ kw. and emergency set | Passenger between Glasgow and Sydney, N.S.W. |
| New York and South American Line | s.s. "Crofton Hall" | 1½ kw. and emergency set | Passenger between United States and South American States |
| Elder Dempster & C ... | s.s. "Elmina" ... | 1½ kw. and emergency set | Passenger between Liverpool and Lagos |
| Colonial Sugar Company of Australia | s.s. "Fiona" ... | 1½ kw. and emergency set | |
| P. & O. Steam Navigation Co. | s.s. "Isis" ... ... | 1½ kw. and emergency set | Passenger between England and the East |
| " " " | s.s. "Osiris" ... | 1½ kw. and emergency set | Passenger between England and the East |
| La Compagnie Generale Transatlantique | s.s. "Versailles" ... | 1½ kw. and emergency set | Passenger between Bordeaux and Casablanca |

Marconi's Wireless Telegraph Co., Ltd., have received instructions to install wireless telegraphy apparatus on two new vessels at present in course of construction, but destined for service with THE REID NEWFOUNDLAND COMPANY.

In addition to the ten vessels of the NELSON LINE which are to be immediately equipped with wireless, arrangements have been completed with Marconi's Company whereby the seven new vessels which the Nelson Line has decided to build will also be fitted with wireless.

The DEMPSTER LINE has decided to have eleven additional vessels of its fleet equipped with wireless, and orders have been placed with Marconi's Company, Ltd., accordingly.

LES SOCIÉTÉS DES PÊCHERIES have approached La Compagnie Française de Télégraphie sans Fil with a view to having wireless installed on their trawlers.

Several vessels owned by the Sociedad Navegacion e Industria, and of the Cia Mahones a de Navegacion, have been fitted with Marconi apparatus by the COMPANIA NACIONAL DE TELEGRAFIA SIN HILOS. The "Rabat," of the COMPANIA TRANSATLANTICA ESPANOLA, has also been equipped.

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# Maritime Wireless Telegraphy

THE European public know comparatively little of the shipping services which link up the American Continent with China and Japan. Some of the liners on the Pacific routes are among the finest in the world, and, like the vessels traversing the better-known Atlantic and Eastern routes, they go forth upon their voyages equipped with that marvellous instrument of communication—wireless telegraphy. To the fleet of the Canadian

*Mrs. G. M. Bosworth, wife of the Vice-President of the C. P. R. and Director of the Marconi Wireless Telegraph Company of Canada.*

Pacific Railway trading across the Pacific is shortly to be added the "Empress of Asia," which was launched from the yard of the builders, the Fairfield Shipbuilding & Engineering Co., Ltd., Govan, on November 23rd, 1912. The christening ceremony was performed by Mrs. Bosworth, the wife of Mr. G. M. Bosworth, vice-president of the Canadian Pacific Railway Company, and a director of the Marconi Wireless Telegraph Company of Canada.

The "Empress of Asia" is the eighth vessel built by Fairfields for the Canadian Pacific Railway, and with her sister ship, the "Empress of Russia," marks a new epoch in Trans-Pacific travel. These two vessels will be by far the largest plying between the American Continent, Japan and China, measuring 590 ft. in length, 68 ft. in breadth, and 46 ft. in depth, and of about 15,000 tons gross. Their speed will be 18 knots an hour.

In addition to their size and speed these vessels will have a number of attractive features. The main saloon will be no less than 74 ft. long and 64 ft. wide, lit from the sides by a number of beautifully designed windows nearly 5 ft. wide, and from above by a large well.

The first-class state-rooms on the bridge deck will be enclosed in a complete steel deck-house. Each of these rooms will have sleeping berths for two persons, and a couch so arranged as to be easily converted to a bed should it be found necessary. The sleeping berths again will be so designed that should one passenger only engage the room, all evidence of the other berth will be hidden, leaving only a single brass bedstead.

A number of single as well as double berth rooms will be provided so that the growing class of passengers who desire privacy can be catered for. There will also be a number of suites consisting of bedroom, sitting-room and bathroom. Besides the usual spacious dining saloon, lounge, café, library and writing-room, a large gymnasium will be provided on the upper deck. This will be fitted with a large variety of exercising machines. Another feature adopted for the first time will be the laundry, which will be found of great convenience, especially in the hot weather on the Chinese coast. In view of the service in which these vessels are to be engaged, the installation of refrigerating machinery fitted is very large, and comprises two machines for the preservation of perishable provisions for the ship's use. In order to ensure the safety of the vessels in the event of collision or grounding, the hulls are to be subdivided by numerous watertight bulkheads, closely spaced; one effect of which will be that any four compartments can be open to the sea, or flooded, and the vessel will remain afloat. This is considerably in excess of Board of Trade requirements.

A departure from current practice has been made in deciding to construct the vessels with cruiser sterns and rudders entirely underhung This form of stern, besides giving the vessels a very distinctive appearance, increases the

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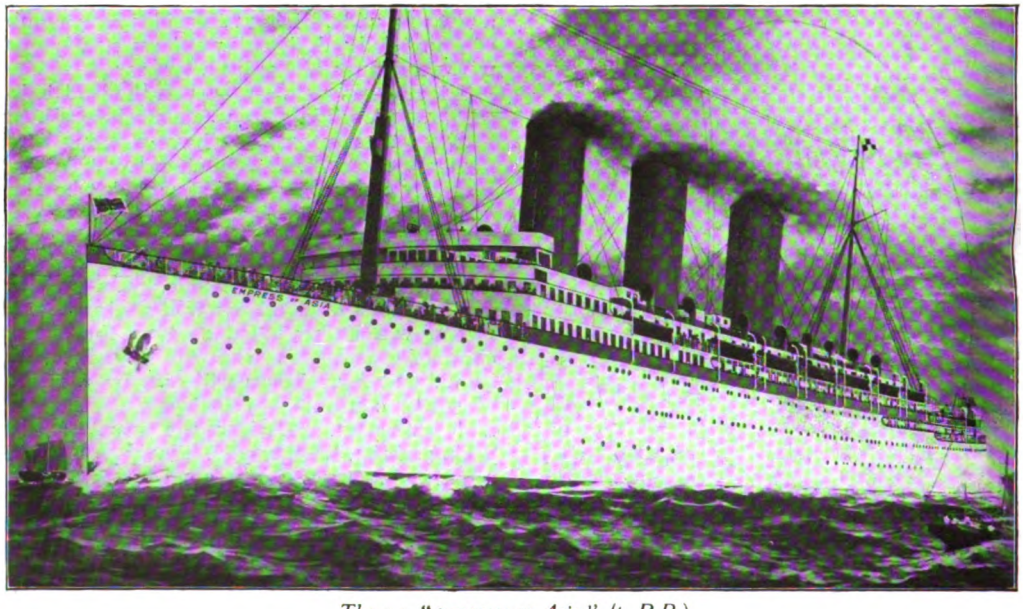
effective length of the waterline, and so assists propulsion and adds considerably to the available deck areas at the after end.

The vessel will, of course, be fitted with a standard Marconi 1½-kw. modern apparatus. Special arrangements have been made for carrying silk, as it is by the Canadian Pacific route that the bulk of this commodity is conveyed from Japan to the markets of the world. By following a specified northern course, the C.P.R. mail steamers shorten the route by about 300 miles as compared to the routes to United States ports.

The necessity of wireless telegraphy was very much emphasised when the "Noruega" met with a very serious accident some weeks ago off Cape Hatteras. The "Noruega," of course, was equipped with the Marconi system, and the operator at once got into communication with two United States battleships and two revenue cutters. Assistance was promptly given, and the ship was towed to Newport News. The only salvage which the company had to pay was some $12.50, which had to be paid out on account of meals of some of the passengers who were taken off and placed on board a revenue cutter.

According to the *Times*, grave uneasiness was shown during the past month among underwriters for the safety of no fewer than ten large cargo vessels considerably overdue on Atlantic passages. All the vessels were known to have met with very violent weather, but none of them were equipped with apparatus for wireless telegraphy. The financial interests in the missing vessels were very large—the values of the ships and cargoes being roughly given in each case between £50,000 and £100,000. There is no exaggerating the uneasiness felt by the absence of news concerning the missing vessels; some of the vessels were practically uninsurable, and rates advanced to 90 per cent. The occurrences of the past month are a striking argument in favour of the equipment with wireless apparatus of all classes of vessels, especially those carrying large crews and valuable cargoes.



*The s.s. "Empress of Asia" (C.P.R.)*

Preparations are being made at Fishguard Harbour for equipping the four turbine Fishguard-Rosslare vessels, the "Saints," with the Marconi wireless apparatus. Three additional telegraphic clerks are to be appointed to the harbour staff, all the members of which are to receive instruction in wireless telegraphy, and they will then take turns on the vessels.

The accounts of the P. & O. Company for the year ending September 30th, 1912, show an item—£7,845—as expended on wireless telegraphy. It is stated in the report that there will be a considerable increase under this head in future accounts.

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# The Gun-Runners

## A Syntonic Tale of Two Arcs, a Spark, and a Loose Coupling

IT was Sir Harry Lancing, the licensed wit of the Savage Club, who described the steam yacht "Miranda" as a "morganatic cruiser." The description caused a wave of laughter round the smoking-room of the club, followed by ripples along Pall Mall and Piccadilly, and occasional eddies in Mayfair and Belgravia—in all of which areas the Hon. Percy Morgan was well known. His reputation for Imperial patriotism had narrowed the doubt as to his descent. Everybody — himself included—regretted deeply that he was the second son, and not the first, of Baron Morgan of Belvedere. Save for that accident of heredity he would have been the decorative head of the All-Red party in the House of Lords. As things were, it was necessary for him to establish his position by means of intrinsic merit—aided, perhaps, with a little judicious advertisement.

Consequently he had built the "Miranda" for his Imperial tour. It would have been easy for him to telephone to Cook's for an itinerary, and to perform the tour by coupon; but that would have smacked of Bayswater, out of which his family had risen two generations before. So he called for naval architects, and shipbuilders, and engineers, and decorators, and upholsterers, and artists to produce a 3,000-ton steam yacht which would represent the climax of speed and luxury. Nothing was left undone which could induce the daily and weekly papers to take a keen interest in the vessel and its mission. The model selected was that of a British cruiser—not, it must be observed, the all-grey craft which is made to slink past unobserved, but the earlier type, with its full and conspicuous glory of yellow funnels, white paint for the deck works, and black hull with gilt lines.

### The "Wireless" Crown

The crowning feature of the vessel was the wireless installation, which was then a novelty except among ships of war and a few of the largest liners. Visitors who were privileged to see over the boat prior to her departure from Southampton, gazed with proper awe at the aerials, and peered with an expression of wonder within the operator's cabin. So much was made of this installation that the owner was suspected by more than one weekly review of being a shareholder in the company, and of having done the whole thing as a blatant puff.

So the Honourable Percy Morgan set out on his grand tour with his daughter to keep him company. The vessel had been named after her; and she—according once more to Sir Harry Lancing—had been called Miranda as a hint that her father's proper name was Prosper-o.

The world heard from the "Miranda" at the West Indies, British Guiana, the Falkland Islands, New Zealand, Australia, the Malay Peninsula, Rangoon and India. It was in India that Mr. Morgan learned all about the Persian question, and he was so impressed with it that he determined to survey the Persian Gulf, although his daughter had grave doubts about the scenic and social values of that region.

"The place is infested by pirates," she declared. Then she added, as an afterthought, "I shall be bored to death."

"That is not the method adopted by the modern pirate," remarked her father, with that air of easy facetiousness which was afterwards, he hoped, to delight the House of Commons, if not the House of Lords.

In spite of her protest, the course was set for the Gulf of Oman—a place which, Miranda feared, would turn out to be a gulf of Noman. She felt inclined to pray for a pirate to provide a diversion which would make her cease to regret the loss of the hospitable excitements of India.

The Straits of Ormuz were traversed without incident, but when the "Miranda" entered the Persian Gulf the monotonous serenity of the blue sky was broken by the signs of storm. Captain Colquhoun wanted to turn back immediately to Bandar Abbas, and he relapsed into his native Gaelic when Mr. Morgan reminded him, with uplifted forefinger, that Britannia ruled the waves. Within an hour or two, however, even Mr. Morgan was tempted to doubt whether Britannia's sphere of influence extended to the Persian Gulf. The "Miranda" had weathered not a few storms during her long voyage, but as the vessel reeled and shook under waves that fell upon her from all points of the compass at once, Mr. Morgan began to wonder if his obituary notice in the *Times* would extend to one or two columns.

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Towards evening the influence of Britannia began to make itself felt, and it was possible for Mr. Morgan and Miranda to venture on deck. It was then that the look-out sighted a sailing vessel, scudding under bare poles, with her fore top-mast broken and leaning in a tangle of cordage and torn sails against the main-mast.

Captain Colquhoun did not wait for orders to shift his course and bear down upon the stricken vessel. The salvage instinct is nowhere stronger than in the Scotchman. As for Mr. Morgan, he perceived at once that the rescue would represent a paragraph in every British newspaper, and possibly some foreign ones.

The vessel, however, showed no signals of distress. When the "Miranda" drew near enough for details to be observed, the crew were visible on the poop, huddled together out of reach of waves that swept the main deck. The approach of the "Miranda" seemed to agitate them, as they could be seen gesticulating wildly and pointing at the oncoming steamer. Captain Colquhoun wanted to lower a boat to take a towing rope across, since he judged that the crew, like most seamen from south of the 54th parallel, were not fit to save themselves; but Mr. Morgan stiffly reminded him that the "Miranda" carried the latest type of rocket apparatus.

The "Miranda" came close to windward of the sailing ship. The first rocket went wide, but the second carried the rope close to the main-mast, where it hung amidst the wreckage. Then the rescuers waited for the rescued to act. They waited while Captain Colquhoun said, "I told you so," in a variety of Gaelic forms. He was on the point of ordering a boat to be lowered when a tall figure broke from the swaying crowd on the poop, hung for a moment or two on the port ladder until the deck lifted itself clear of the welter of water, and then raced amidships and climbed the ratlines of the main-mast.

### One Man on Board

Miranda confessed to herself, as she watched the performance through binoculars, that it was worth coming all the way to the Persian Gulf to see it. The rope hung tantalisingly out of reach; and with the irregular swaying of the vessel it was doubly difficult for the climber to know which hold to trust. He scrambled higher in the maze of rigging, testing each strand with swift care before he leaned his weight on it; but his manœuvres, although they were vastly exciting, did not bring the coveted rope much nearer to his hands. Then he retired to a yard-arm, where he appeared to think the situation over, and in a few minutes he renewed the attack with a length of rope tied to a block. He swung this out until, after many attempts, it fell across the rocket rope and curled round it. Before the watchers on the "Miranda" had finished cheering, he was on deck with the rope between his teeth.

Here the performance changed to comedy. Making the rope fast to a stanchion, the man ran aft and plunged among the crew, emerging after a struggle holding two men by the collar. He ran with them towards the ladder, released them, and pointed forward. They cringed like schoolboys afraid to take a plunge; but when they caught the gleam of a revolver barrel they dropped down the ladder and fled along the deck, timing their performance so badly that they were all but swept away in a great sea that poured over the gunwale. The tall figure followed and drove them to the bow, where the three hauled until the thick rope fastened to the rocket rope came on board and was made fast to the capstan. The vessel slowly drew bow on to the sea, and more hands were brought forward to the capstan. In half an hour's time a wire cable stretched between the ships, and the "Miranda" was slowly towing the "Euphrates" into shelter.

They anchored just before sundown in the bay of Nebkhara, where the only sign of life on the low sand hills was provided by a few huts, apparently belonging to fishermen. Captain Colquhoun sent a boat across to the "Euphrates" with his compliments and an invitation for the captain to come on board the "Miranda;" but the answer, delivered in good English, was to the effect that the captain of the "Euphrates" begged to be excused, as he and his crew were exhausted by the unusual labours of the day. He would pay his respects to the captain of the "Miranda" at dawn.

The peculiar effect of this reply was deepened by a communication which the quartermaster made privately to Captain Colquhoun and Mr. Morgan. He had seen naval service in Eastern waters, and the appearance of the "Euphrates" awoke memories. As a result of his communication the "Miranda's" searchlight was switched on, and, after a preliminary sweep of the hills, was focussed on the hull of the "Euphrates."

### What the Searchlight Saw

The deck of the vessel was swarming with the men who were so exhausted that they could not thank their rescuers. Many of them were carrying burdens, and, as the glare of the searchlight fell upon them, they stood for a few seconds as if arrested by a lightning stroke. Then a sharp order was heard, and they disappeared with magical rapidity behind bulwarks and deck gear. The change was so

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swift and so complete that the observers could hardly believe that their eyes had not deceived them in the first vision of the men.

"Damned fine salvage," said the captain abruptly.

"Oh, I know what they are," exclaimed Miranda. "They are gun-runners. How perfectly lovely!"

"Your comment verges on the absurd," remarked Mr. Morgan. "Captain Colquhoun, will you oblige me by calling Binney?"

Binney's position on the "Miranda" was a sinecure. During the many months of the voyage he had had little to do but listen for X's, and he had been obliged to while away the time by reading Hallam's "Constitutional History," and Gibbon's "Decline and Fall," varied by *faute de mieux* flirtations with the stewardess and the two ladies' maids who had been considered by Mr. Morgan as essential for his daughter. This call to action surprised him as much as the kiss must have startled the princess who had been asleep for a hundred years.

Mr. Morgan's first words to him surprised him still more.

"Mr. Binney, be good enough to signal the nearest British warship."

"The what?" gasped Binney.

"I think my instructions were perfectly clear. And even if I asked you to signal to Mars, I expect my orders to be obeyed without demur."

Binney spent the whole night "tickling the ether," as he described it to the stewardess when she crept up to him with a consolatory cup of tea. It was not until an hour before dawn that the tickle took effect. An answer came from H.M.S. "Nestara," a very sceptical answer, the answer of a man who profoundly suspects a practical joke. Binney had hard work to make the "Nestara" believe that he was the "Miranda," owner the Hon. Percy Morgan, long. E. 55, lat. 25°15', with a gun-runner at anchor within a quarter of a mile. The signals became faint with the approach of dawn before he had completely converted the sceptic.

### Mr. Morgan's Diplomacy

Mr. Morgan, it must be confessed, handled the situation like a born diplomatist. He perceived that his best plan was to prevent the "Euphrates" repairing the damage or realising that her trade was suspected. It was necessary, that is to say, to maintain the *status quo* until the "Nestara" should arrive. Something must be done to remove the impression created by the searchlight, which had never been far away from the "Euphrates" all night.

Accordingly he sent a letter at dawn to the captain expressing his hope that he and his crew were rested, and craving leave to present two cases of wine for the refreshment of the crew. At the same time he begged the captain to do him the honour of breakfasting with him.

"Miranda," he said, as he observed the boat returning, "I have invited the captain of the 'Euphrates' to breakfast. You will please make yourself particularly amiable to him. I want to lull his suspicions as far as is possible, and induce him to remain comfortably at anchor for another day or two."

"Oh," remarked Miranda, "then I am glad I put on my Indian muslin."

She stood well back to give the Indian muslin every chance as the captain stepped on deck. She was a little daunted, however, by his appearance. His manner with her father and Captain Colquhoun was easy, if not gentlemanly, but he wore no collar on his cotton shirt, his grey suit was stained with tar and dust, and his boots gaped. For all his upright bearing and his new-shaven face, he certainly looked like a man who had just escaped shipwreck.

Miranda must have revealed her feelings in her expression as Captain Ingarfield stepped forward and was presented to her. His eye twinkled as he looked steadily at her.

"Good morning, Miss Morgan. I look like a tramp, and I feel like one. But, you see, I have just stepped off a tramp vessel."

Miranda flushed at his polite impertinence. Then her look changed.

"You are the man who climbed the rigging yesterday," she said quickly.

"Exactly," he said, "and the ten minutes up there did more damage to this suit than all the wear it has had in the ten years since I brought it second-hand in Ratcliffe Highway."

She felt that he was making fun of her, but before she could frame her resentment in a retort, the gong sounded for breakfast. Mr. Morgan was well aware that a bugle-call was the correct thing on board ship, but he preferred the gong, as it was more decorous and solemn.

When Captain Ingarfield heard the sound, his head went up and his eye shone.

"Dear old England!" he said, looking at Miranda with so frank an admiration that she was in doubt whether to accept it for herself, or for England, or merely for breakfast.

### A Gentleman Gun-Runner

Before the meal was over Miranda had convinced herself that Captain Ingarfield was a gentleman. Consequently he was a ne'er-do-well, since no self-respecting English gentleman would be found commanding a gun-runner. And being a ne'er-do-well he was a fit object

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of feminine compassion and solicitude. Handsome, in spite of his clothes! And courtly in his manners. Moreover, she always found his gaze resting upon her when her glance returned to him. The evident effort which it cost him to move his eyes away from her was a subtle and impressive compliment.

It was Mr. Morgan's policy to let his guest talk; and he talked with perfect freedom on every subject except the "Euphrates." Leading questions were parried so skilfully that Mr. Morgan himself forgot about them, and found himself immersed in a discussion on the proper treatment of subject races. He was surprised to find a man whose knowledge of the Empire and its mission was almost comparable with his own.

The Imperial conversation was resumed on deck, and continued uninterrupted until Captain Ingarfield happened to glance skyward and noticed the aerials stretched between the masts.

"The greatest invention of the age," remarked Mr. Morgan.

Captain Ingarfield appeared to be wrapped in contemplation of the strain insulators.

"Yes," continued Mr. Morgan. "I place Mr. Marconi next to Archimedes, Newton and Watt. I expressed myself in these words to him at a meeting of the Royal Society, and he appeared to be extremely gratified. I have one of the very latest types of apparatus on board. One never knows, you see. . . . There is my operator, Mr. Binney."

**Binney Yawns**

Binney passed them with a very alert expression, but at the door of the operator's cabin he yawned preposterously. Captain Ingarfield observed him from the corner of his eye.

"Mr. Binney does not sleep well at nights," he remarked, turning to Mr. Morgan.

Mr. Morgan flushed. "His duties occasionally interrupt his slumbers," he explained.

"In the Persian Gulf?" asked Captain Ingarfield.

"He was trying to get into touch with the station at Aden—" chimed in Miranda. "He is always experimenting that way, and it is easier to send messages in the dark."

"Is that so? But when I was at Aden——"

Captain Ingarfield stopped. Binney had left the door of the cabin open, and the *zip, zip* of the spark could be clearly heard. Mr. Morgan, aware that the conversation had taken a dangerous turn, started on the Imperial track again, and talked steadily with what he knew to be absorbing eloquence. Captain Ingarfield was certainly absorbed; he lay back in his deck chair with his eyes half-closed, smoking slowly in the manner of a man whose mind is fully occupied.

At the end of an hour Binney reappeared and signalled to Mr. Morgan, who rose and went aft. Miranda, left alone with Captain Ingarfield, noticed him smile.

"You are amused, Captain Ingarfield?"

"At life's little incongruities. Yesterday and to-day, for instance. To-morrow may be just as different from both as each is from either. Who knows? And in the East, who cares? Wireless telegraphy will never be popular out here, Miss Morgan, because it means that somebody is fidgetting about what is going to happen to-morrow. It is as out of place in the Persian Gulf as a searchlight itself."

"A searchlight?" queried Miranda, innocently.

Captain Ingarfield rose and looked at her steadily.

"Miss Morgan," he said slowly, "you are the only woman I ever met with eyes exactly like those of my mother."

Before Miranda could recover from this attack, Mr. Morgan returned and asked Captain Ingarfield if his duties would permit him to return for dinner that evening.

"Neither my duties nor my wardrobe," replied Captain Ingarfield.

"I would ask you to remain for the afternoon," added Mr. Morgan, "but it is my invariable custom in these latitudes to rest for three hours."

"Admirable! I am sorry that the accommodation on the 'Euphrates' will not enable me to return your hospitality. I do not know that I could offer you so much as a cup of tea."

He looked appealingly at Miranda as he spoke; and before he left the ship Miranda found an opportunity to whisper to him that tea was at four o'clock.

**Miranda Plays Traitor**

He returned an hour before that time, and sat on deck with her, talking steadily. For the time being she was Miranda in the fascination which this unknown Ferdinand exercised upon her; for the rest she was Desdemona at the feet of Othello. He talked of England, of school, of Oxford, of his first voyage, his shipwreck, his fighting in South America, his experiences as a prospector in Mexico, his wanderings on the shores of the Mediterranean, his final yielding to the magic of the East. Miranda listened, and thrust out of her mind the thought of the cargo which lay in the hold of the "Euphrates," and the vision of the "Nestara" flinging the foam from her bows as she raced over the miles which lay between her and Nebkhara.

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Mr. Morgan, emerging from his invariable rest, noticed them together and retired with a diplomatic smile. Captain Ingarfield did not say good-bye until the sudden night had fallen. As he turned to leave her she whispered his name sharply.

" You called me ? " he asked.

Her face, visible in the reflection of a deck light, showed acute distress.

" Yes. I have no right to tell you, but I must tell you—to—to beware."

He came close to her, and her eyes sank under his look.

" Why do you tell me this ? "

She put her hands out to him appealingly. He caught them and held them.

" I have a message for you," he said slowly. " It is this : be afraid of nothing—and *wait*."

He released her hands and walked quickly to the gangway. She did not move until the boat had returned from the " Euphrates."

**The Search**

Next morning the dawn revealed the " Nestara " at anchor close to the " Miranda." Mr. Morgan surveyed her with a proud consciousness of duty performed, of the power of the Empire, and of the marvels of wireless telegraphy. He watched the lowering of a boat and its passage to the " Euphrates " ; he watched the short colloquy on deck, and waited with carefully concealed impatience for the reappearance of the search party. After a full hour the bluejackets emerged again, tumbled into the boat and rowed towards the " Miranda."

Mr. Morgan had carefully prepared, and had rehearsed again and again, his neat speech to the captain of the " Nestara," politely deprecating any idea of thanks and declaring his pleasure at having been the humble instrument of serving the Empire.

The captain, however, had a brow like thunder and an eye like lightning. For the first few minutes of their interview all that he could say was, " Not a damned rifle, and not a damned cartridge, in the whole damned hulk."

Mr. Morgan was destined to hear these words in his dreams for many a night afterwards.

**A Reception, and Another**

Six months later, however, he had recovered sufficiently to carry out his intention of holding a magnificent reception in London as the climax of his tour. Magnificent, because it was at once huge and select. More than one duke was present; peers were plentiful; the Cabinet was there to a man ; and the cream of the diplomatic, social, scientific and artistic circles of London had been whipped for the occasion.

It was towards the end of the great event, when most of the guests were departing, that Sir Thomas Knaresby asked permission to introduce his son. Mr. Morgan turned languidly to shake the hand of a tall young man whose face seemed familiar and suggested something obscurely unpleasant. He was surprised to see his daughter turn pale at sight of this stranger ; he was still more surprised when Miranda consented to take the arm that young Knaresby offered her. They walked away together.

" That's my young rover come back again," said Sir Thomas proudly. " If ever you want a secretary who knows the world inside out and back again, Harry is your man."

Mr. Morgan grunted unsympathetically. There was something very puzzling and very annoying about that young man's back.

Harry led Miranda straight to a seat in the conservatory. But she did not sit down. She turned towards him, her head high, her eyes full of pride struggling with surrender.

" Tell me the truth ! " she cried.

" I love you," he answered.

" I know that."

" And you will marry me."

" A gun-runner ? " Her voice became almost hysterical for a moment.

" Even that," he returned.

" Yet you are not that. No one could ever make me believe that you are that."

" But even if I were, you would still marry me."

He persisted, beating down her opposition and her questioning with a deep gaze which showed the glint of humour she remembered so well. She gave him her hand at last, and they sat down together.

" Tell me at once," she said, " the whole story."

" I told you it all that glorious afternoon—all but the last chapter. I came on board the ' Euphrates ' by the merest chance. One night at Aden I got mixed up in a scrimmage. Some Arabs were belabouring another native ; no doubt he deserved it, but I went in on his side. It was as good as a football match for about five minutes ; and then the native and I had to fight a rearguard action, to put it mildly. All the scum of Aden seemed to be upon us. He was no coward, because he could have bolted and left me to the wolves. But he sang out that he had a boat handy, and he stuck by me until we were near the beach. For the last fifty yards it was a question of revolvers, and you can imagine I was glad to find myself in the stern of a ship's boat, being rowed like fury away from the furies.

" You can also imagine," he went on, " that I was glad to stay *perdu* in Saladin's ship—

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we'll call him Saladin—while it meandered round the coast of Arabia. He had saved my life, in a sense ; and I was bound to say nothing when I discovered that he did not trade in innocent Brummagem goods and the products of Persia. That was the situation when the storm smashed us up. Saladin thought the 'Miranda' was a cruiser, and was ready to scuttle the ship. That was why I could get nobody to lend a hand in the towing business. My kindly host begged me to get him out of the scrape by pretending to be captain, under an assumed name. During the first night we were busy getting the cargo ready for taking ashore, when the searchlight struck us.

"Heavens, the oaths—in every Mediterranean tongue. I thought you must have heard them and been scarified. We did not move a limb all night, except to creep further out of sight. Then in the morning I had to find out how much you knew or suspected. The wireless performance told me everything. I spelled out every word the ingenious Binney sent to the 'Nestara.' Your father, of course, never dreamt that I knew a letter of the Morse code. But while he talked I found out just how many hours we had before we would be searched."

"You played us a trick ? "

"Yes, and such a simple one ! On the second night, while your searchlight played on our starboard side, we were busy at the port side of the lower deck sinking the cases silently one by one. If there had been a real seaman on board the 'Miranda' he would have noticed that in the morning we drew a foot less water than we had done the night before. Saladin took a thousand bearings of the spot, and no doubt he has had the guns up months ago."

"I wonder," said Miranda, with a smile, "if you really behaved as a loyal British subject ? "

"I doubt it," replied Harry cheerfully "Once or twice, during breakfast on the 'Miranda,' I was tempted to give Saladin the slip and go back with you. It was the bacon and the marmalade that did it. But as soon as I heard the wireless go *zip*, I felt that I had to uphold the sacred rights of hospitality and get Saladin out of the mess. Was your father very angry ? "

"He will never forgive you."

"Well, the father's forgiveness does not seem to matter much in these days of eugenics, and anarchy, and revolting females, and——"

"And wireless telegraphy," she added.

But their subsequent communications, being at extremely short range, did not involve that form of Hertzian wave action.

## Brevities

". . . A Marconi has been of more use to Italy and to the world than a second Raffaello or a second Michelangelo could have been."—Richard Bagot in *Gens Italica*.

The opinion of experts was only useful for the purpose of prophecy. When the experts said they could do a thing, it was desirable to wait until they had done it before their views should be accepted.—COMMANDER LORING.

"At a dinner of the Musical Association, Dr. Cummings said he hoped that in future they would have higher and better branches of the art to investigate, and in this connection referred to the great developments in wireless telegraphy. This is a direct incitement to Dr. Richard Strauss to write a syntonic symphony, in four-sevens time."—*Electrical Industries*.

At a dinner given by the Authors' Club, in honour of the Lady Sybil Grant, Mr. Walter Emanuel read some amusing telegrams purporting to convey regret of celebrated absentees from the function. Amongst them were the following :

Mr. Lansbury (the rejected of Bow and Bromley) : "Thanks for offer of a seat, but it is in the wrong place."

Mr. G. Bernard Shaw, in reply to query whether he was coming, wired : "You never can tell" ; while Mr. G. K. Chesterton answered : "I am not Shaw."

Mr. Marconi : "I consider it an insult to ask me to send you a wire."

Often passengers who run short of ready cash send wireless messages to their bankers in New York or London for a remittance. The money is advised to the purser, who advances it to the passenger. This system, apparently, is not always an advantage to the passenger of gambling propensities, and the following may be cited as a warning : A certain gentleman lost all his ready money at cards in two days after the vessel left New York. As soon as he could he got a wireless advice from his bankers for £150, but ere the voyage was over he only had a five pound note left. He confessed to the operator before leaving the ship that he would never send a wireless message for money again.

A conference has been called in Russia in order to draft regulations for the Government supervision of wireless stations and the use of wireless on foreign ships in Russian waters.

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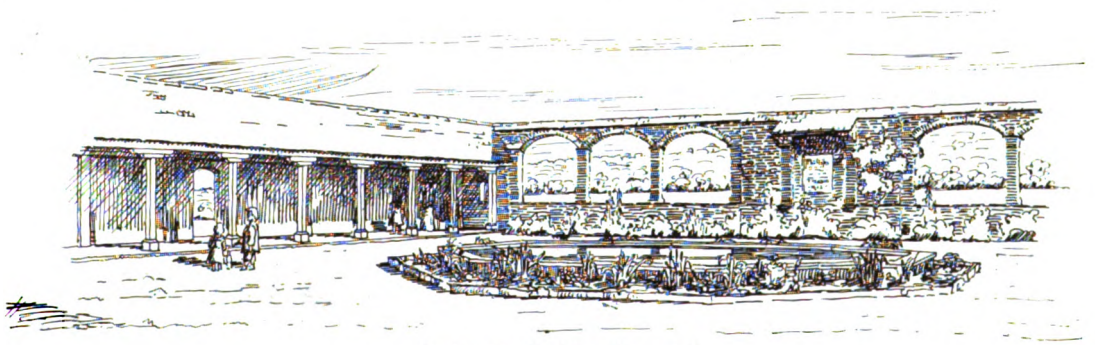
## The Phillips Fund

THE committee of the Phillips Memorial have now issued an appeal for further help to complete the scheme of a cloistered square looking out on to one of the most beautiful views of meadow and wooded hill that is to be found near Guildford. Accompanying the appeal is a sketch of the cloister as it will appear when completed, and this is herewith reproduced by kind permission of the committee. It shows the greater part of one of the three cloistered sides, and of the fourth wall to the south-east, which is pierced with arches to the right and left of the Memorial Panel. In the foreground is a large water-lily tank, which is to be bordered with a wide flower-bed.

If the amount subscribed permits the adoption of the scheme, Godalming—the birthplace of Phillips—will be provided with a beautiful and fitting memorial to its brave townsman.



*Design for Phillips Memorial*

This sheltered spot will afford an opportunity of rest and quiet recreation to many; particularly as the enclosure is not intended to be a children's playground, or a spot for noisy merry-making, for a green playground adjoining provides ample space outside for noisier pastimes. It is connected with the Phillips cloister by a door in the eastern wall (shown to the left of the illustration), so that in the case of a sudden storm the occupants of the meadow may have easy access to the shelter of the cloister.

The total amount subscribed to the fund is £430, and the estimated cost of the completed scheme is £700, leaving a balance of £270 yet to be obtained. The Mayor of Godalming and many members of the Memorial Committee have expressed their willingness to receive subscriptions, while copies of the appeal will be forwarded immediately on receipt of an application to Mr. T. Percival Whately, the Town Clerk, Godalming.

## A Clearing House for the East

IN the course of an article drawing attention to the continuous presence in the harbour of vessels fitted with wireless, the *Straits Times* of Singapore appeals to the local shipping agents to co-operate with the Government in receiving messages from ships expected, announcing the approximate time of arrival, the quantity of bunker coal, water or fresh provisions required, and similar information whose early receipt would economise time and facilitate the working of the ship's business generally. The Government is providing itself with legislation giving it control over the working of wireless installations on board ships within the jurisdiction of the port authorities. The inference from that would be that the Master Attendant's Department would be the proper agency to receive and distribute such messages as might arrive from ships in the China sea making for Singapore, and be picked up by the wireless installations of ships in the roads or at the wharves. Our contemporary suggests that this could be done in the following way: A list should be kept of all ships equipped with wireless running to Eastern ports. When one of these arrives in port, a circular from the shipping office might notify that the master attendant would receive and distribute any messages from ships in the China Sea, any weather reports, reports of derelicts or wreckage, or reports of ships out of control, with engines broken down, or it may be on fire and needing assistance from salvage vessels, or otherwise. For each such message picked up and sent in to the shipping office a fee should be payable to the ship receiving the message.

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At an exhibition of scientific instruments, held last month under the auspices of the Preston Scientific Society, Mr. J. H. Morris gave interesting demonstrations of wireless telegraphy.

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## Monthly Miscellany

DID any of the MARCONIGRAPH readers wander—or perhaps it would be more appropriate to say lose themselves—in the toyshops of the West End? If they did, there is no doubt they had a bewildering experience. The cult of the child has surely reached a maximum, for half humanity appears to have employed itself in scheming and devising all sorts of fantastic toys and queer games to delight the minds of the juvenile. That is without counting the books which appear in their hundreds, splendidly bound, and lavishly illustrated, not by middling spirits, but by the most skilful artists and cunning craftsmen of the times. And how excellent all this is! The child who is brought up—educated, if you like—on the best, ought to turn out a finer creature than he who was only thought of in leisure moments, or was given anything that "would do" to keep him quiet. But to return to our subject, the most striking feature of all this display was the toy wireless set—a clever little piece of apparatus, and a gift that would fascinate any boy, and bring down his benediction on the giver. Those who made themselves responsible for the pleasure of young England were quick to recognise this fact, for quite early in the season, so the toymen assure us, the demand for this wireless set was abnormal, and it was soon recognised that wireless was to be *the* Christmas toy of 1912, and *the* youthful pastime of 1913. Nor have the results been disappointing; in fact, the trade has been hard put to it to meet the demand. This new toy—though it is really more than that—is made specially under a Marconi licence. It is complete in every detail, and has a really wide receiving range. Its purchase price is £6 10s., but there is another, a little larger set, costing a mere trifle of £10 10s., which can do wonders. It has a complete transmitting and receiving station, with a range of 400 yards, and can be fitted from the drawing-room to the summer-house, from the library to the stable, or in any other position that its owner may think fit, and it is possible to combine a large amount of utility with entertainment. For say the pony is wanted immediately; it is a matter of a few moments to rush to the apparatus and set the transmitter at work. It is understood, of course, that an apparatus capable of being put to such a use as this would need to be supplied with an automatic buzzer. This addition might mean a slightly increased expenditure, but its advantages are obvious. Oh, happy youth with such a wonder-working toy!

* * *

There is a curious and distinctly gratifying sequel to Mr. Marconi's unfortunate accident near Spezzia. This, it will be remembered, took place at a shady turn called the Berghetto Corner, near the village of Borghetti di Vara. Since then the peasantry of the district have taken to calling it "Marconi Corner," and the Municipality of Borghetti has decided to record the event by a marble tablet, which will be inserted in the wall of a neighbouring farmhouse.

* * *

The *Evening News* is to be warmly congratulated on its happy idea of providing London's slum children with dolls and toys so that they might remember Christmas, which, but for this kindly forethought, would mean nothing at all to these unfortunate little ones. As it is, one hundred thousand dolls have made their appearance in quarters where the coming of a doll is an event. And such dolls, too! Their clothes take on and off, and they are clad in purple and fine linen such as their little owners could never hope to wear. How excellently the whole scheme has been managed, and what numbers of hands have assisted to bring this gigantic scheme to so happy a conclusion! Help has come from everywhere, and not least from passengers on some of the great Atlantic liners, who were willing to employ such of the leisure time of the sea voyage on this good work. This doesn't sound as though it had anything to do with wireless telegraphy, but to presume such a fact would be to come to a too hasty conclusion, for the Marconi Company offered their services in the transmission of news about the doll dressing by wireless, free of charge. Bulletins were sent by passengers to inform the *Evening News* of the progress made by workers, who in turn were informed of the daily increase in the number of dolls received. You can imagine the interesting conversations which took place at that time between the ships speaking to each other as they passed in mid-Atlantic—"How many dolls have you dressed? We are on our second hundred."

* * *

A Marconigram will often contain in its curt phrases the suggestion of a comedy, or the outline of some dramatic situation. Of such a nature is the message telegraphed not so very long ago by an Austrian Lloyd steamer to Trieste. It seems that the "Graf Wurmbrand" (for this was the name of the vessel) had on board that redoubtable Albanian leader, Ismail Kamail Bey, who is a keen adherent of Turkish rule. The Greek naval base had got wind of the whereabouts of the chieftain, and two torpedo boats were sent in hot pursuit of the "Graf Wurmbrand." They caught her up just outside Durazzo, and without more ado proceeded on a tour of inspection over the

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unfortunate vessel. But smart as the Greek sailor may be, on this occasion he was not smart enough ; for despite a very thorough investigation, Ismail Kamail Bey was nowhere to be found. Sore perplexed, the search party withdrew to nurse the disappointment, which was the only result of their wild-goose chase. Why they failed was explained in the last few words of the Austrian captain's wireless message, wherein he complained of his treatment to the sympathetic friends at Trieste : " Ismail Kamail Bey, with his followers, had landed a little prior to the visit of the Greeks." How delightful for the escaped chieftain ! Let us hope that a strong wave of wireless imagination enabled him to appreciate the humour of the situation, and gave him the opportunity of waving—at least in metaphor—his pocket handkerchief *en salut d'ironie* at the nonplussed and retreating warships.

* * *

How fast news travels by wireless, and how varied its nature ! Every day the newspapers report information which has reached them by this invisible means. To-day it is a tragedy ; yesterday it was the tale of a gallant rescue ; to-morrow it may be a report of war—or of peace ? Let us hope the latter. Amongst the more recent events notified in this way is the loss of the " Oravia." The circumstances of the disaster afford another instance of the efficiency of wireless in life saving. The vessel was wrecked off the Islands on November 12th, 1912. She struck a rock about half-a-mile from the lighthouse at the entrance to Port Stanley, at ten o'clock at night. Blinding snow and intense darkness made it impossible to see anything. That no life was lost was due only to the fact that the wireless apparatus immediately dispatched distress signals, which were responded to by five whale boats. These arrived on the scene of the disaster only three hours after the ship had struck, and not only were the passengers and crew saved, but the mails and baggage were safely conveyed to the rescue vessels. Nevertheless, the work of rescue was none too quickly accomplished, for shortly afterwards the " Oravia " broke in two and sank.

* * *

Surely some of the saddest news wireless telegraphy ever dispatched was that which was sent out to Mr. Ogden Mills Reid, who was travelling on board the " Kronz Princessen Cecile," to inform him that his notable father had passed away.

# The Training of Operators

THE announcement in the November MARCONIGRAPH that evening classes were to be established at Marconi House for the training of telegraphists to take charge of wireless installations on board ship, has brought shoals of inquiries from intending candidates. Applications have been received from all parts of the United Kingdom, but as the evening classes must obviously be limited to young men who reside in London or within easy reach of the metropolis, the field of selection was limited. But the announcement goes to prove that a very large proportion of young men, who find themselves at present in occupations which do not offer very alluring prospects for future advancement, are willing to enter the wireless service, and take advantage of the favourable opportunities which are open to men of undeniable ability and character.

The evening classes commenced on Monday December 16th last. These classes meet three times weekly—Mondays, Wednesdays, and Fridays—from 7.30 to 10 p.m. During the first hour and a half, instruction is given in Falkland ordinary telegraphic work, such as the Morse alphabet and simple sending and receiving. The last hour, from 9 to 10, is devoted to elementary instruction in electricity and magnetism, and this course has been so arranged to equip the candidates with a sufficient knowledge of the subject to enable them to understand the application of electricity to wireless telegraphy. The students have the advantage of receiving instruction from tutors who have had considerable practical experience over the whole range of wireless telegraphy, and by assiduous attention to the work of the classes they should be able to pass the necessary examinations within a short time. The period of tuition must necessarily depend upon the capacity of the student, but young men between nineteen and twenty-four years of age, possessing even average ability, should be able to pass the Postmaster-General's examination in wireless telegraphy in less than twelve months. Students who have succeeded in passing the necessary examination will immediately join the Marconi Company, and will be drafted for service at sea, and the total fee paid during the period of instruction will be refunded. As we have already stated, the classes commenced on December 16th with sixty-three students. The accommodation of the school, however, is for about twice that number, but the number of applicants by far exceeds the accommodation, which will soon be taxed to its utmost capacity.

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## Football

Since the last issue of this Magazine the Marconi Football Club (London) have not met with much success. They were at home to Ellison on Saturday, November 23rd, and sustained their first defeat in the Western Suburban Alliance, the visitors gaining a victory by three goals to one. On the following Saturday the Palmer Tyre Club visited the Acton enclosure in an Alliance match, and were rather lucky to escape with one of the points. A goalless draw was the result, and the faulty shooting of the home forwards, combined with an excellent display by the visitor's goalkeeper, saved the Palmer Tyre from defeat. On December 14th North Paddington paid a visit to Acton, and defeated the home team by three goals to nil. Playing Wembley away from home on December 21st the Marconi club were defeated by five goals to three.

To compensate for the indifferent performances of the first team, the reserves were at home to Ealing Y.M.C.A. on December 7th, and after a good match gained a victory by three goals to one.

## Personal

Mr. E. Blake, operator-in-charge of the station at Soller, has obtained leave to proceed to England to be married.

Mr. James Gill, who has been appointed resident inspector for the Marconi International Marine Communication Co., Ltd., in New Zealand, left London by the s.s. "Turakina" on November 28th.

Mr. H. Caswall, of the engineering staff of the Marconi Wireless Telegraph Co. of Canada, was married on December 7th at Folkestone (England), to Miss E. Bluett. Before leaving Montreal, Mr. Caswall was presented by his colleagues with a cabinet of cutlery. Mr. and Mrs. Caswall returned to Canada at the end of December.

## Movements of the Engineers

### (London)

F. E. Burrowes has returned to London from the Falkland Islands, and is now on foreign service leave.

H. B. T. Childs, who has been superintending the erection of steel masts for the Canadian Marconi Co., is now on his way back to England.

R. G. Kindersley has returned to London from Broomfield, and is now at the head office engaged in special work.

R. K. Rice left London for Malta on December 21st to superintend the erection of a 1½-kw. Marconi land station for the Eastern Telegraph Co.

W. S. Entwistle has arrived in London from special leave in South Africa, and is at Marconi House.

H. Longton has been transferred from the company's Broomfield technical school to the head office telegraph training school for further instruction.

### (Canadian Company)

W. A. Appleton, assistant engineer of the Newfoundland Labrador, has left for Montreal after the closing of the Labrador stations.

J. O. G. Cann, engineer in charge of the Labrador stations, who has been engaged in superintending the closing of Point Rich station and the overhauling of Point Amour station, has now left the Straits for the winter.

E. E. Richards, having completed the inspection and overhauling of the Gulf of St. Lawrence and Eastern stations, has returned to Montreal.

### (Spanish Company)

Messrs. Sauvé and Hughes, of the Compañia Nacional de Telegrafia sin Hilos, are engaged on erection at Finisterre and Santander stations. Mr. Walsh is in charge of the erection of the Santander station.

Mr. Johnson, of the Compagnie de Télégraphie sans fils, has proceeded to Malaga.

## Movements of Operators

L. G. Hosking, from the Clifden Station to the "Saxon."

T. Knox, from the "Parisian" to the "Caledonia."

S. P. Lewis, from the "Arcadian" to the "Ionic."

S. W. Lewis, from the "Oravia" to the "Desna."

H. T. Little, from the "Highland Brae" to the "Highland Warrior."

S. A. Ludlow, from the London School to the "Avon."

C. T. Massey, from the "Garth Castle" to the "Avon."

J. Mather, from the "Himalaya" to the "Maloja."

H. Matthews, from the "Carmania" to the "Empress of Ireland."

P. Mattock, from the "Caronia" to the "Teutonic."

C. V. Maudsley, from the North-Eastern Counties Exhibition to the "Caledonia" (P. & O.).

G. N. McCormack, from the "Munster" to the "Dakar."

J. M. McKenna, from the "Lake Champlain" to the "Pomeranian."

T. W. Murray, from the "Lusitania" to the "Worcestershire."

W. Murphy, from the London School to the "Franconia."

P. R. Norwood, from the "Cedric" to the "Bohemian."

C. S. C. Nixon, from the London School to the "Dongola."

D. O'Sullivan, from the Liverpool School to the "Cedric."

E. Overall, from the London School to the "Pomeranian."

R. H. Packer, from the "Minnewaska" to the "Simla."

K. W. Page, from the "Winifredian" to the "Bohemian."

R. V. Patrick, from the "Kenilworth Castle" to the "Edinburgh Castle."

A. E. Perfect, from the "California" to the "Mongolian."

C. W. Perkin, from the "Hildebrand" to the "Runic."

C. Peters, from the "Hyacinthus" to the "Ivernia."

R. Plummer, from the "Minnewaska" to the "Mayaro."

G. Plummer, from the "Mayaro" to the "Minnewaska."

W. Raw, from the "Empress of Britain" to the "Hilary."

C. Robertson, from the "Milwaukee" to the "Zealandic."

J. Ralphs, from the "Bohemian" to the "Atahualpa."

C. T. Sanders, from the "Amazon" to the "Arlanza."

R. C. Scott, from the "Ausonia" to the "Corinthian."

W. H. Silvester, from the "Gaika" to the "Dunvegan Castle."

H. J. Stanley, from the "Majestic" to the "Iroquois."

A. W. Stephens, from the "Avon" to the "Carisbrook Castle."

A. E. Shorter, from the "Majestic" to the "Rohilla."

D. H. Sinclair, from the "Ausonia" to the "Corinthian."

S. C. Summerlin, from the "Columbia" to the "Hesperian."

J. L. Salmon, from the London School to the "Scotian."

A. F. Smith, from the London School to the "Ionian."

E. G. Terraneau, from the "Belgic" to the "Hyacinthus."

J. R. Thomson, from the "Elmina" to the "Oravia."

R. W. Tymms, from the "Akabo" to the "Belgic."

B. W. Tinker, from the London School to the "Aragon."

J. Vincent, from the "Bohemian" to the "Desna."

C. B. Vaughan, from the London School to the "California."

G. P. Wakeling, from the "Gloucester Castle" to the "Elysia."

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# International Radiotelegraphic Time-Signals

THE International Radiotelegraphy Conference, which met in London last summer, was soon followed by an International Time-Signal Conference, which deliberated at Paris from October 15th to 23rd, by invitation of the French Government, on the organisation of a radiotelegraphic time-signal service. The special object of the Conference was to arrange for a distribution of stations, so that every spot in the ocean should be able to receive at least two signals in the course of 24 hours. One of the first points to be considered in this connection was the prevention of interference of signals coming from stations not sufficiently distant from one another. For this reason the list of new stations at present projected does not include any stations in the British Isles and in Italy. Several of the new stations first to be built are to be situated in places which are generally considered to be rather out of the world. Thus, Africa is to have stations at Massaua, in Erythrea (Italian Red Sea district), Mogadiscio (Somaliland), Timbuctoo (Sahara); America, in Arlington (State of Washington), San Francisco, San Fernando (Brazil), and far out in the ocean on Honolulu (Sandwich Islands); other stations in the Pacific are to be erected in Samoa, Guam (Marian Islands), and Manila (Philippine Islands). The control of the service is to be placed under an international bureau at Paris. As regards the reception of the time signals, two methods are in use, apart from the rough method of observing the second hand of the watch whilst listening to the signal. Either the signal is automatically recorded, together with the chronometer time, or the Vernier method of comparing two watches is applied. The first method is probably the most exact; but it requires rather complex apparatus, and a good deal depends upon the time-constants of the apparatus itself; the Conference would prefer this method if it could be simplified. A second method is based upon the acoustic coincidences of the beats of two pendulums or hair-springs of slightly different periods. For this purpose a pendulum of a period of 0·98 seconds emits, on the Eiffel Tower, series of radio-signals which coincide about every 50 seconds with the beat of a watch; these coincidences are very sharp, because each signal is produced by a single spark, not by a train of sparks. In future such coincidence signals will be given every night for a short time before the time-signal proper, so that the observatories within reach can check each other. Storm and iceberg notices are also to be transmitted. The international service is to commence in July of this year, provided that the representatives of the sixteen States which took part in the Conference find the necessary official support.

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HIS EXCELLENCY GENERAL DON JOSÉ
DE BASCARÁN Y FEDERIC

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# His Excellency General Don José de Bascarán y Federic

HIS EXCELLENCY DON JOSÉ DE BASCARÁN Y FEDERIC holds a very prominent position in the Spanish Army, but perhaps it is of more interest to our readers that he is a director of the Compañia Nacional de Telegrafia sin Hilos, of Madrid. Despite the apparent remoteness between the two offices General Bascarán holds, the combination is, as a matter of fact, both happy and appropriate, more especially as it occurs in the person of an eminent Spaniard, for Spain is amongst the most advanced nations in the practical application of wireless telegraphy. From the very outset she took an interest in this great invention, for she immediately foresaw its possibilities, as she recognised that without wireless telegraphy the country would be, as it were, a deaf mute among nations; dependent upon the elements for the delivery of all communication, however great its importance, while her commercial activity and her military prestige would be paralysed by inadequate means of communication.

On November 28th, 1911, was inaugurated her elaborate wireless service by the opening of high-power stations at Cadiz, Teneriffe, Las Palmas and Barcelona, while a little later internal communication was perfected by the opening of a central wireless station at Aranjuez, and on this occasion General Bascarán was amongst those assembled to meet King Alfonso, who opened the station in *propria persona*. But His Excellency's influence is most notable in the development of wireless for the military service in Spain, for, being himself a general of ripe experience, he is well aware of the immense advantages, nay, rather of the absolute necessity, of wireless for modern generalship. As a result, not only has the Army been efficiently equipped, but every effort has been made by the authorities to see that its working capacity is employed to the greatest advantage; and, further, that those to whom the control of this important asset in modern warfare has been given are acquainted with it, not only from the standpoint of a mechanical instrument to be used for the transmission of messages, but have some theoretical and definite knowledge of the principles of wireless science.

He was responsible also for the initiation of the recent manœuvres at Madrid with the portable wireless stations which aroused so much interest throughout the country. These demonstrations were not only watched by all the Spanish military authorities, but by an appreciative assembly which included King Alfonso and Queen Maria Christina, while the events were reported at considerable length in the Press.

King Alfonso, as is well known, takes the keenest interest in the welfare of his army. Only lately he is reported to have said, "If I were not King I should be a captain in the army." It was fitting, therefore, that Senor Bascarán should be one of the principal members of the brilliant group of officials assembled to meet King Alfonso at the demonstration. Indeed, it would be impossible to imagine such an event taking place without his being present, for, besides being a notable member of the wireless world, he is a *persona grata* with His Majesty the King of Spain, from whom he holds his appointments as Aide-de-Camp, General-in-Chief of H.M. Military Household, and Military Governor-General of Madrid. In fact, His Excellency is a well-known figure in the *entourage* of King Alfonso, and has accompanied him on almost all his journeys outside Spain. In this connection he has visited England, France, Germany, Austria and Bavaria, and has been the recipient of many honours from many foreign potentates. He is the holder of the Grand Crosses of the Red Eagle and Crown of Prussia, First-Class Cross of Hohenzollern, Grand Cross of the Iron Crown and Francisco José, Military Merit of Bavaria, Grand Cordon of the Legion of Honour and Grand Victoria Cross, having besides, the Grand Portuguese Crosses of San Benito de Avis and Concepcion de Villaviciosa, and the Spanish Crosses of Carlos III., Military Merit Isabel la Catolica, San Hermenegildo and Naval Merit.

But it was as a soldier that His Excellency first made his mark. During his military career he has held the important posts of Chief of the Field Section in the Ministry of War, and Chief on the general staff of the Captain-General Martinez Campos, whom he accompanied to Marrakesh to negotiate the Peace Treaty between Spain and Morocco in the year 1894. At one time he was the Professor of the General Staff Corps School, and is the author of several books on artillery practice.

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# The Theoretical Explanation of Wireless Telegraphy

**By Professor J. W. Nicholson**

THE writer has been urged several times to publish, in an expanded form, his remarks made at the British Association during the discussion on the principles of wireless telegraphy, opened by Prof. J. A. Fleming. THE MARCONIGRAPH, as the journal of the company to whose energies the practical advancement of the subject is so largely due, is evidently the most suitable place for such an account as is contemplated in the present article.

After the admirable account of the present state of the theory given by Prof. Fleming, there seems to be little to add, if anything, on the historical side, and it may be assumed that an acquaintance with all the leading theories which have been proposed is a permanent possession of all the readers of Prof. Fleming's introduction. We shall limit attention, therefore, to a discussion of some of the theories, in the endeavour to select the particular one against which theoretical objections are of least importance.

### A Negative Theory.

Theories of wireless telegraphy, like theories of any other phenomenon, can, of course, be positive or negative. Although the present writer is frequently credited with the possession of a definite theory of wireless telegraphy, the position he has taken up is in reality a purely negative one—that diffraction cannot explain the results achieved by the practical engineer in wireless telegraphy. In the first place, therefore, we shall confine our attention to the problem of diffraction. Prof. Fleming has indicated the manner in which the mathematician has attacked this problem. For the convenience of his analysis, the mathematician has assumed the earth to be a perfect conductor; that is to say, a body which in transmitting electricity must show the "skin effect" absolutely, and confine an alternating current entirely to a minute depth from the surface. There are other simplifications which do not need mention in detail. Such a starting-point may appear somewhat artificial and removed from the practical aspect of the subject, but nevertheless it must be a special case of the practical problem, and any solution which is true for the practical problem has its analogue in this theoretical problem—an analogue which must preserve even the orders of magnitude of the various quantities concerned in the two problems; for example, energy received at a station. The mathematical problem has the further merit of supplying an *upper limit* for such quantities. It is evident to any engineer that a wire of a greater conductivity than a second wire is capable of transmitting more energy under any conditions; and if, in the words of the mathematician, we proceed to the limit, and imagine a wire of greater conductivity than any we have experienced, a correspondingly larger amount of energy will be transmitted by it. Such principles, of course, apply if the wire is replaced by the earth. As Lord Rayleigh remarked at the British Association, it would be surprising if it were found that the imperfection of the earth's conductivity really assisted the propagation of waves from the transmitter to the receiver.

### Mathematical Solution

The mathematical solution, therefore, of the diffraction problem must endow a receiver, in any case, with more energy than it could possibly collect in practice if diffraction, or wave-bending, is the only agency with which the practical telegraphist has to deal. If the energy so found is too small to be detected by the present degree of sensitiveness of our instruments, we must dismiss diffraction from the field of possible theories. Let us examine the results of such a mathematical solution without taking account of the height of the antenna. This height is evidently a help, but in the *Philosophical Magazine* of November last the writer showed that this degree of help is too small to make any appreciable difference in the results. With a simplification which is therefore legitimate, we can show that the amplitude of a wave which, by diffraction, reaches a receiving station, bears to the amplitude at the sending station a ratio

$$38{\cdot}98.\ \tan\tfrac{1}{2}\theta.\sqrt{\sin\theta}.\ \tfrac{1}{\lambda}\tfrac{1}{\theta}.\ (\cdot 7006)\ \tfrac{\theta}{\lambda}\tfrac{1}{3}.$$

where $\theta$ is the angle subtended at the centre of the earth by the two stations, measured in degrees. If m is the number of miles between the stations, $m = 70\ \theta$ approximately. The wave-length of the oscillation in air is $\lambda$.

### Diffraction and Wave Lengths

This formula can be tabulated at once for any given wave-length, and we may examine

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it for the practical case which is usual in signals sent by the Marconi Company. Prof. Fleming has emphasised the fact that it has not been numerically tested for such long wavelengths. A set of tables suitable for wavelengths of about a quarter of a mile was given in the *Philosophical Magazine* for January, 1911, and showed undeniably that diffraction cannot be an important factor for such wavelengths. For example, it was shown that if the distance between the stations is 2,000 miles, the energy falling on the receiver is only the fraction $10^{-12}$ of the energy falling on a similar receiver at a distance of 70 miles. For a receiver at 6,000 miles, roughly the greatest distance at which wireless messages have been successfully transmitted, the ratio has sunk so low as $10^{-40}$. These figures are absolutely convincing for waves of such a length, and they are quite in accordance with those of the analogous optical case quoted by Prof. Fleming in his article.

But the Marconi Company uses much longer waves, and the difference in the results for such waves is very appreciable on account of the exponential factor in the law of diminution of the waves, so that another precise numerical test of the diffraction theory is desirable. Can it, by an increase of the wave-length sixteen times, explain Mr. Marconi's signals from the Clifden station to South America, a distance of 6,000 miles? We have only to insert $\lambda=4$ and $\theta=90°$ approximately in the formula. Thus

$$\text{Sin } \theta=1, \text{ tan } \tfrac{1}{2}\theta=1.$$

and the final amplitude received becomes $5.37.10^{-8}$. This is the ratio of the amplitude received to that leaving the oscillator. The ratio of the energy-densities in space at the two points is the square of this quantity, or $2.88.10^{-15}$, and this is the ratio which is important in practice.

### Other Theories

Although the difference in this case is very considerable, the result leaves no hope of such an explanation as a basis for wireless telegraphy. We are compelled, therefore, to consider other theories. As regards the mathematical accuracy of the formula, it is sufficient to mention that three entirely distinct modes of solution have led to the same results—those of the late Prof. Poincaré, of the present writer, and finally of Dr. H. W. March, of Göttingen.

Prof. Fleming is in favour of Prof. Sommerfeld's theory. He has given so complete an account of the surface waves which appear in Sommerfeld's investigation that there is no need to go over the ground again. As a mathematician who has carefully studied this work the writer is compelled to record his conviction that, from a mathematical point of view, Sommerfeld's investigation, as would naturally be expected from so distinguished an analyst, cannot be attacked. Prof. Fleming has expressed a wish that it should be confirmed independently, and the writer is very glad to be able to meet this wish.

But at the same time, in taking up the view that these surface waves are actually the efficient factor in wireless propagation, an assumption is being made which calls for examination. Prof. Sommerfeld's theory is worked out on the mathematical supposition that the earth may be treated as a flat interface separating two media, both of which, in this simpler problem, can be endowed with all the imperfections of conductivity and the like which are inherent in the materials with which the practical man has to deal. He thus obtains the surface waves or *oberflächenwellen*, whose energy only falls off according to the inverse distance, and not the square of distance, so that at a great distance from the antenna they are still very important. They actually become zero as the conductivity of the earth is mathematically increased, so that their absence from the investigations on diffraction is not surprising. But is it correct, on account of their mathematical form, to formally identify them with surface waves such as are found on wires, and to assume that they would travel freely round the *curved* earth which is dealt with in the real problem? They are only a part of the whole solution for a flat interface, and it is only a mathematical fiction to suppose that an observing engineer would perceive the space and surface waves superposed. He would only perceive the whole effect, and the division into two classes is a purely mathematical process. It is not mathematically possible to suppose that, if we could transform the solution for a plane interface to one involving a curved surface, the space waves would transform into corresponding space waves, and the surface waves into waves which travel freely round the curved surface. We can only say that the whole effects would transform, but any artificial separation in the one case does not of necessity correspond to an exactly similar separation in the other. Unfortunately this transformation of solutions cannot be made, and it can only be done in the reverse order. But it does not seem possible at first sight, even when account is taken of the imperfect conductivity, for the formal solution appropriate to a sphere to give waves whose energy falls off inversely as the distance; and it is by no means certain, therefore, that Sommerfeld's solution takes account of the real problem, though mathematically exact as it stands. A

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more complete investigation, starting with the curved surface, is necessary, and fortunatelv mathematically possible.

### Sommerfeld's Waves

We are familiar with the fact that a plane can be thought of as a sphere of infinite radius, so that a solution of any problem for a plane must be a special case of a solution for a sphere. But if we take any sphere and multiply its radius indefinitely, we at the same time multiply any length of its arc. An arc of one foot on the sphere becomes an indefinitely long line on the plane. In particular, a distance of a few feet on the earth, measured from a sending station, corresponds to an infinite distance on a plane. A solution found for a plane interface may therefore correspond to a solution over a very limited range of the actual earth. This may explain what can happen to the surface waves of Sommerfeld if the more practical problem is treated, for it may only be possible to divide the effect partially into surface waves in the immediate neighbourhood of the sending station. If this should turn out to be the case, as seems probable, another theory of wireless telegraphy must be found.

The theory which seems most promising is that partially worked out by Dr. W. H. Eccles. From the mathematical point of view no serious criticism can apparently be made. Prof. Fleming raised an interesting point with respect to which it seemed doubtful, but Dr. Eccles has overcome the difficulty. We shall not at this point give an account of the theory, for it is familiar to readers of this journal. It possesses the great advantage of taking account of a phenomenon discovered by Mr. Marconi—the difference in transmission by day and by night—and, as Lord Rayleigh said at the British Association, this phenomenon seems to demand a theory on these lines for its explanation.

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# Unsolved Problems of Wireless Telegraphy.

## By Dr. A. Sommerfeld (Munich).

I SHALL try to answer the questions put by Professor Fleming, before the British Association meeting at Dundee, from the purely theoretical standpoint.

1. "The exact nature of the machinery by which the transmitter affects the receiver" is given by Maxwell's system of equations. Possibly they may not accurately hold in detail or for the interior of atoms; as regards the character of the phenomena on a large scale they have, however, so far always proved applicable.

2. Maxwell's equations show that a "Hertzian wave effect pure and simple" is not possible near the boundary of a heterogeneous (conducting or dielectric) material; in such material secondary effects are induced which also influence the propagation of waves in air.

3. In the vicinity of the transmitter the earth acts as a "perfect conductor"; at a greater distance the finite magnitude of the conducting power has to be considered. What is to be regarded as a small or as a large distance depends upon the conductivity and the dielectric constant of the soil, as well as upon the wave-length, and cannot accurately be defined theoretically. With long waves over the sea all attainable distances have to be regarded as small (in this sense).

The earthing of the transmitter has no influence upon the process of the spreading of the waves. This is to be understood as follows: Two different transmitters (more or less perfectly earthed), which give the same amplitude of wave at a small distance, will also give waves of the same amplitude and shape at any other distance. Two such transmitters will, however, require currents of quite different intensities and different energy supplies. Thus the efficiency of emission (the ratio of the wave-energy at distance 1 to the energy supplied) depends upon the earthing. In what way it depends can only be determined experimentally for each transmitter. On the other hand, the efficiency of the spreading of the waves (the ratio of the wave-energy at distance $r$ to the wave-energy at distance 1) is independent of the earthing. This may be proved by general theoretical considerations.

4 and 5. There is no contradiction in principle between "true diffraction" and "surface waves." Both the phenomena may be explained by the Maxwell equations. In the case of a curved surface the two cannot be rigorously separated, any more than the space waves (of the Hertz type) can be separated from the surface waves (of Rayleigh's type); the boundary conditions near the earth's surface necessarily connect the two kinds of waves with one another.

6. As regards the influence of the curvature of the earth, I have not myself published any quantitative deductions; I have merely expressed the supposition that the type of

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surface waves might be favourable for overcoming the curvature. I have, however, induced Dr. H. W. March to investigate this problem (Dissertation, Munich, 1911, and *Annalen der Physik*, vol. xxxvii.). March found for the amplitude A at a point, which is situated at the geocentric angle $\theta$ from the transmitter,

$$(1) \quad . \quad . \quad . \quad A = \frac{A_0}{\sqrt{\theta \sin \theta}};$$

that is to say, for small $\theta$ the diminution of A would be proportional to $\theta$, and thus to the distance as measured along the earth surface; for large $\theta$ the diminution would be less rapid; and for $\theta > 110$ deg. the amplitude would actually increase. Unfortunately, this result is not mathematically correct, as Poincaré demonstrated in 1912 in the *Comptes Rendus*. For there should be added to formula (1) the exponential factor

$$(2) \quad . \quad . \quad . \quad e - \beta \left(\frac{2\pi a}{\lambda}\right)^{\frac{1}{2}} \theta$$

(where $\lambda$ = wave-length, $a$ radius of the earth, $\beta$ a numerical factor smaller than 1). When this correction is made, the result of March approaches those of Poincaré and Nicholson. March therefore proposes to retract, in the *Annalen*, his objection to those researches. The exponential damping of the type (2), having thus been deduced from Maxwell's equations in three independent ways, may henceforward be accepted as proved.

The curvature of the earth therefore produces a dispersion of the waves, which increases as an exponential function of the geocentric distance. It would appear to me that the numerical magnitude of this dispersion has been overestimated by Poincaré and Nicholson. The theoretical value of the order of magnitude of the dispersion would probably agree with Austin's observations, whilst Poincaré considered it a hundred times too large. The empirical damping factor of Austin's formula further accords in form with the theoretical formula (2), except that Austin has $\lambda^{-\frac{1}{2}}$, whilst in (2) it is $\lambda^{\frac{1}{2}}$. We must not be too much impressed by the exponential function of (2), but must bear in mind that for the large wave-lengths of the Transatlantic service $\left(\frac{2\pi a}{\lambda}\right)^{\frac{1}{2}}$ is a moderately large number—*e.g.*, being equal to 21·5 for $\lambda = 4$ km.; therefore the power index of (2) would only be 4, for $\theta = 15$ deg. (corresponding approximately to the largest distance of Austin, which is 900 nautical miles), and for $\beta = 0{\cdot}7$ (Nicholson's value for this factor). In these calculations the earth is presumed to be a perfect conductor; a preliminary calculation has demonstrated that the finite conductivity would possibly improve the resulting wave transmission to a certain, but not to an important, degree.

The form of the factor (1) points, as March has shown, to a surface distribution of the waves. Sin $\theta$ is, indeed, proportional to the size of a great circle upon the earth (a parallel) described by the receiver about the transmitter; assuming a pure surface spreading, the energy would be inversely proportional to the area of this circle. In reality the distribution is not purely of a surface character, for there is in (1) the factor $\sqrt{\theta}$, in addition to $\sqrt{\sin \theta}$; and in (2), moreover, there is the important exponential dispersion.

7. I do not believe that we should look for other explanations as long as the above formulæ, derived from the simplest assumptions, have not been compared with quantitative experiments.

8. From my formulæ (*e.g.*, in the *Jahrbuch*) there results, "apart from the earth curvature," a large difference in the spreading over land and over sea, and also over fresh water and sea water, especially in the case of small wave-lengths. The practical endency to pass more and more to large wave-lengths can, from my standpoint, be understood on the hypothesis that the larger wave-lengths suppress the influence of both the imperfect conductivity of the earth and of the curvature of the earth.

9. We may conceive that a non-uniform ionisation of the atmosphere will disperse the waves.

10 to 14. The difference between the night range and the day range seems to indicate that the sunlight exerts an unfavourable influence upon the range, either by improving the conductivity of the air, or in accordance with the interesting hypothesis of Fleming. For this reason I should think that the ionisation of the upper atmosphere may not conversely be resorted to as favourable for overcoming the earth curvature.

15. The research of Hörschelmann would, in my opinion, appear to rest on a strict electromagnetic basis; it does not make use of any special hypothesis made *ad hoc*; he considers in a certain measure even the shape of the antenna. A criterion of the correctness of his hypothesis would be supplied, if it could be demonstrated that the Marconi transmitter does not possess any directive power on board ship.

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Rear-Admiral Inglefield, secretary of Lloyd's, informed the Board of Trade Committee inquiring into the question of danger caused to navigation by derelicts, that there are 1,705 British and foreign steamers fitted with wireless telegraphy.

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# Directional Wireless Telegraphy

**By an Engineer**

IN many cases the fact that a wireless message travels out from an ordinary aerial in all directions is of the most vital importance—an advantage which cannot be over-estimated or rivalled. A ship in distress, for instance, can in a moment send its call for succour, echoing far and wide, summoning help from any direction where help is available. A land station can send its daily news-message to countless ships dotted about the high seas, and one ship can speak with another wherever it may be, provided only that it is within the circle which represents its " range."

But so many and varied are the claims of wireless that every day sees some new development and some new use, and for some of these it is no advantage—it may even be a disadvantage—that the message should be sent in more than one direction. When this is so, the energy radiated in other directions is wasted, and the attractive problem of how to avoid this waste of energy forms the keynote of an article contributed to *The Times Engineering Supplement*, which we reproduce below.

At present the only methods which have justified their use in practical wireless are two—the Marconi Directional aerial, and the Marconi-Bellini-Tosi system of aerials. To the former of these the article refers briefly when it speaks of " some of the Transatlantic antennæ." The latter it also mentions, referring to a more complex arrangement than those dealt with by Dr. Bellini in the January MARCONIGRAPH.

Other methods, some of them successful in the laboratory, have up to now failed when applied to practical use. As the writer of the article remarks, Hertz demonstrated that electro-magnetic waves could be refracted by a " large " pitch prism, and many experiments have been described dealing with the reflection of waves.

But it is in the word " large " that the difficulty lies—a difficulty not mentioned in the article. A ray of light can be refracted by a very small prism, but the very small prism is very " large " when compared with the wave-length of light. So Hertz, dealing as he did with electro-magnetic waves measured in inches, succeeded in refracting them by the use of a " large " prism—large when compared with his short wave-lengths. To work on the same lines with the waves of practical wireless telegraphy—" Marconi " waves—a prism would have to be " large " when compared with anything from a quarter of a mile to eight miles. And the same difficulty arises in the case of reflection.

Towards the end of the article appears its *raison d'être*—a bare outline of some new experiments in this direction which appear to have given results satisfactory to the experimenters.

It is impossible to form an opinion as to the value of these results from the data given ; we are afforded no hint as to what scale the experiments were on. To realise the importance of this point, one has only to suppose that the tests were made with waves 20 feet long from an aerial, say, 5 feet high, and that the " reflecting surfaces " had to be placed perhaps in a semi-circle of radius equal to a quarter wave-length, and were also 5 feet high. Suppose, for the sake of argument, that this arrangement worked well, and then imagine it applied to a commercial wireless wave even so short as 600 metres from an aerial 300 feet high. We do not wish to suggest that anything of the kind applies to the experiments in question, but the example makes it clear that the information supplied is quite inadequate for forming an opinion.

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(Reproduced from *The Times Engineering Supplement.*)

Increased strength of received signals is a matter of paramount importance in the development of radiotelegraphy ; such an absurdly minute quantity of the energy used in transmission is actually received that any present system is enormously wasteful compared with line telegraphy. It is, of course, impossible to make fair comparisons without taking into consideration the initial cost of cable laying, upkeep in each case, and so on. The fact remains, however, that a very real advance will be made in the day when less loss of energy is experienced in wireless transmission.

The direction of the energy radiated from the aerial helps to some extent to solve this problem, if the shape of the aerial tend to produce radiation within a limited area. Any method of direction which depends on the absorption or destruction of the radiations outside the desired area is, of course, useless as a means of concentrating the energy received and thus making radiation less inefficient. The whole problem of directing and concentrating the energy transmitted from a wireless station appears to depend on the aerial and the transformer of the oscillations. Ducretet showed in 1898 how by means of a transformer in the transmitting circuit the radiating power could be greatly increased, and on several occasions he referred to the necessity for the use of oscillation transformers and for the tuning of the

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sending and receiving aerials. It is only one step from the use of transformers in the transmitting circuit for producing persistent oscillations to their use for the direction and even the concentration of the transmitted energy. In Bellini and Tosi's arrangement for directing signals they employ what may be regarded as two aerials ; one of these is composite, and its effect is to transmit a maximum of energy in one direction, while the other subdues or counteracts the radiations in the opposite direction. The shape of the aerial and its position relative to the earth have a marked influence upon the direction of the radiation, and Berthenod's discovery, described in the *Engineering Supplement* on October 23rd, shows how productive a sphere of experiment the aerial still remains. The arrangement of some of the Transatlantic antennæ is such that maximum radiation takes place in the direction in which the receiving station lies, and this has made the regular transmission of messages far more certain.

But the final problem in wireless transmission will be the confinement of the radiations to a small area, which area can be both controlled and directed, and some recent experiments made with this end in view have not been entirely unsuccessful. Using a large pitch prism, Hertz demonstrated in the very early days the fact that electro-magnetic waves could be refracted, and many experiments dealing with the reflection of the waves have been described. The experiments consisted in the use of " reflecting surfaces," which in themselves were radiators, and their radiations were in such phase that they appeared to converge the radiations emanating from a central large inductance aerial. The reflecting surfaces consisted of inductance coils wound round frames in which numbers of small soft iron rods were fixed normally to the plane of the coils. Briefly summed up, the result was that a considerably larger amount of energy was picked up at the receiving station than was possible with the methods generally employed, and signals could be obtained at a distance at which in the ordinary way they were quite inaudible. It may be reasonably assumed from these results that it is possible to concentrate, as well as to direct, the radiations from a transmitting station ; in other words, to get considerably more power with no increase in the energy used in sending the signals.

Combined with the extra power obtained through the use of continuous oscillations, the direction and partial concentration of the radiations should soon admit of direct relay work through a rectifier, or the use with a high frequency relay—an apparatus recently perfected in Germany—of a Morse inking apparatus coupled direct to the aerial and earth.

## Technical Notes

MEASUREMENT OF WAVE-LENGTH.—In a communication discussing the measurement of wave-lengths in wireless telegraphy, which Mr. R. Jonaust contributes to the *Journal de Physique*, he points out that the period of an oscillating circuit may be calculated by Kelvin's formula when L and C are accurately known. In a wave-meter, where one of the constants is variable, it is necessary to be able to make high-frequency measurements of both L and C. Usually the inductance is fixed and the capacity variable. The necessity for measurements of the capacity may be obviated by measuring the potential at the condenser terminals by the current circulating in the circuit. If V be the p.d. and I the current, then : $V = I\sqrt{C\omega}$. For resonance $LC\omega^2 = 1$ and $\omega = V\,LI$. An electrometer is used for obtaining V, whilst I is measured by a thermo-ammeter. The author shows that the equation holds for damped oscillations, using the equations established by Bjerknes. The value of the self-induction L is obtained by comparing it with a standard coil and using an Anderson bridge.

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ELECTRICAL RESEARCH.—The Council of the Institution of Electrical Engineers have decided to take up the question of research, and have appointed a Research Committee, both to co-ordinate and to originate research in the electrical industry. The organisation and correlation of the research work carried on within the sphere of influence of the Institution will include the following : (1) The establishment of a general committee for research to which investigators will be invited to send particulars as to the subject and character of the researches they are undertaking. Members of the Institution, especially those connected with the manufacturing side of the industry, will also be invited to communicate to this committee any special difficulties they had encountered which called for investigation, and to make suggestions for subjects for research. The general committee will thus act as a species of " clearing house " for research topics, receiving suggestions from various sources and sending them on after consideration to the most suitable quarters. (2) The collection and publication of particulars of plant available for special testing and investigation work in the various laboratories, together with a list of the subjects in which researches have been carried out. (3) The compilation and publication of bibliographies of specific fields of research. The general Research Committee will have power to appoint sub-committees of experts to deal with researches in selected subjects.

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# Volcanic Eruptions and their effect upon Wireless Telegraphy.

By A. G. McAdie

THREE volcanic eruptions have occurred since January, 1911, in districts bordering on the Pacific Ocean. These form the subject of a paper issued by the United States Weather Bureau at Washington, and from which excerpts may be given as showing the effect of these eruptions upon wireless telegraphy. One of these eruptions occurred at Mount Katmai, in the Alaskan peninsula, on June 6th, 1912, and is best described by an extract from the official report of Capt. K. W. Perry, commanding the revenue cutter "Manning":

*Scene of a Volcano five minutes after Eruption.*

About 4 p.m., June 6th, 1912, the "Manning" lay moored at the wharf at St. Paul (Kodiak), Kodiak Island. About 4 p.m. I observed a peculiar-looking cloud slowly rising to the southward and westward, and remarked to a friend that it looked like snow. Later, distant thunder was heard, and about 5 p.m. I noticed light particles of ashes falling. At 6 o'clock the ashes fell in considerable quantities, and gradually increased. The cloud-bank had spread past the zenith when I observed another bank to the northward, and the two met about 30° above the northern and eastern horizon. Thunder and lightning had become frequent at 7 o'clock, very intense at times, and though lacking two hours of sunset a black night had settled down. It was impossible owing to electrical conditions to use the wireless apparatus. . . . The 7th began with volcanic matter falling, which diminished and finally ceased at 9 a.m., when it was believed the eruption was over. All of this time no one knew where the eruption had occurred. All streams and wells had become choked, about 5 inches of ashes having fallen. At noon ashes began to fall again, and at 1.30 p.m. it was impossible to see over 50 feet. At 2 p.m. pitch darkness had settled in, heavy static disturbances were observed, and our wireless was dumb. The night was spent in anxious watching. The dawn of the 8th failed to appear. While all ashes of previous day had been removed, masts and yards were loaded, as were also the ship's boats. The ashes were now fine dust and flakes of yellowish colour. Sulphur fumes came at times. Avalanches of ashes on the neighbouring hills could be heard, and these sent forth clouds of suffocating dust and ashes. . . At 2.30 p.m. the fall of ashes decreased, the skies assumed a reddish colour, and distant objects became dimly visible. . . . At 5.30 p.m. the ship set off with two leads going, and at 5.55 we anchored in the outer harbour, having secured a bearing on Woody Island that practically assured us a safe passage to the sea, even though darkness again set in. The night of the 8th was spent in suspense, but as the morning of the 9th dawned the fall of ashes ceased, and it was felt the eruption was over.

Another description of the eruption is given by Mr. O. W. Carlson, travelling in the s.s. "Dora" from Unger to Kodiak:

The vessel was going north-east, and on evening of June 5th put in at Cold Bay,

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25 miles from the volcano. The following afternoon at 1 o'clock, as the ship was passing through Karluk Straits to reach the town of Kodiak, the wireless operator reported hearing a loud thundering through his instrument. The concussions were so loud that the operator refused to remain at the instrument. The ship was then about 75 miles from the volcano. A few minutes after the operator gave the alarm, passengers heard thundering, followed by an electrical storm with brilliant lightning flashes. From the volcano burst a sheet of flame several hundred feet high. Dense clouds of smoke and ashes poured forth, and three hours later, at 4 o'clock, a pall of almost impenetrable darkness enveloped the mountain and surrounding country. By 5 o'clock it had reached out to sea, and the "Dora" was forced to abandon landing at Kodiak, nothing being visible even on the horizon toward the east, except a thin streak of light which disappeared a few minutes later. When we first sighted the flames shooting up from the crater the day was perfectly clear, but almost immediately after the first eruption the air became laden with fine volcanic ash, which enveloped everything and penetrated to all parts of the ship. When darkness came, flashes of lightning followed one another in quick succession throughout the night. About dawn a reddish tinge shown on the horizon, and a little later it became yellowish. At 10 o'clock on the morning of June 7th we got out of the haze and sighted Barren Island. We could still see smoke issuing in an uninterrupted stream from the mouth of the crater, but a west wind followed by a north-westerly breeze carried the cloud away from us. That day we visited the ports of Saldovia and Homer in Cook's Inlet, and on the morning of the 8th anchored off Port Chatham. We were then about 90 miles from Mount Katmai, but we headed into a rain of dust that covered the ship from stem to stern. The dust from the first eruption was white and coarse, but that we encountered was yellowish and as fine as talcum powder. None of us suffered any ill effects from dust or smoke.

Through the courtesy of Lieut. Reed M. Fawell, U.S.N., Acting Radio Officer, and Mr. L. Malarin, Marine Superintendent of the Marconi Wireless Telegraph Company, reports have been obtained from various radiotelegraph stations in the vicinity and south as far as San Diego. The following report was made on June 26th by the electrician in charge of Kodiak, Alaska, radio station:

The first intimation of any disturbance was about 2 p.m., June 5th, when static became so heavy that no signals could be read, not even with the U.S. revenue cutter "Manning" alongside the dock in Kodiak, two miles away. At 5.15 p.m. ashes commenced falling from a westerly direction at both Kodiak and the ratio station on Wood Island. Streaks of lightning and heavy thunder commenced with the fall of ashes, and were continuous with them. At 6 p.m. the amount of falling ashes had increased so much that one could not see over 10 feet. The lightning made it dangerous and impossible to use the radio set. The lightning switch was cut in at 6.30 p.m., and a spark of about 2·5 inches was drawn in closing it.

The heavy fall of ashes continued, with lightning, until about 9 a.m., June 7th, when it became lighter. About 6 inches of ashes had fallen at that time. Ashes fell continually until about 8.30 p.m., June 8th, and stopped falling altogether about an hour later. The total fall of ashes was about 18 inches. Strong sulphur fumes were prevalent from the morning of the 11th to noon of the same date.

About 11 a.m., June 8th, the station was struck by lightning, and the building started burning at the same time in both the engine-room and the operating-room, and was completely burned to the ground in about an hour. It was not possible to save any equipment, stores, or personal effects in the building. The masts, coal shed and oil house were not injured. The motor dory was sunk by damp ashes on June 8th, but was recovered by the station personnel, cleaned out, put in condition, and is now all right.

The electrician in charge of the Cordova, Alaska, wireless station made the following report on June 10th:

June 6th, at about 4 p.m., the volcanoes Redoubt, Ilamnia and Kamnia, about 200 miles from this station, became violently active. The first intimation we had of such activity was at 5.30 p.m., when static of extreme intensity commenced coming in. No untoward change in barometer was observed, the pressures for the day being, at 4 a.m., 30·12; 8 a.m., 30·10; noon, 30·08; 4 p.m., 30·05; 8 p.m., 30·04; and at midnight, 30·00, being average good weather pressure. At 6 p.m. we were called on telephone and asked if we heard guns firing. No reports were heard here at that time, although they were heard at "Mile 19," a railroad station about 15 miles away.

At 7 p.m. explosions were first heard, sounding somewhat similar to a signal gun, coming at intervals of about five seconds, but varying in volume. The commander of

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the survey boat " Taku " was notified, as it was first believed that some vessel was in distress. These reports were heard from 7 p.m., June 6th, until 10 p.m., June 8th.

Static conditions were such that it was impossible to keep our receiving instruments in service for 48 hours. Ashes fell all day and night of the 7th, being last noticed at noon of the 8th. As soon as it became possible to keep the receiver in adjustment, efforts were made to re-establish communication with the Kodiak station, or the cutter " Manning," which was at anchor there when the eruption commenced. We were unable to raise them, and as a report (somewhat exaggerated) had just been received by cable to the effect that the steamer " Dora," in attempting to approach Kodiak, was turned back while still 90 miles away by showers of rock, dense fall of ashes, and darkness due to smoke, great fears were felt for the safety of the people on Kodiak Island. . . . At 10 p.m., June 8th, the " Manning " was heard calling every station and ship in Alaskan waters. At 12.30 she sent broadcast, " The people of Kodiak are all O.K." Static here was very bad, and it was with difficulty we managed to read the " Manning." A close watch was kept for the Kodiak station and the " Manning " all day of the 9th, and they were called at hourly intervals, with no results. At 10 p.m. of the 9th the " Manning " once more started up, and, although we worked successfully with the steamship " Umatilla," fully 400 miles farther away and in line with the " Manning," we could not get " Manning."

The wireless telegraphic stations at San Diego and North Head reported intermittent static during the afternoon of June 6th, and other stations on the coast reported strong, continuous static. For several days after the 6th static was strong at practically all stations, and communication interfered with.

The Marconi operator at Nak-Nek, 50 miles south of Katmai, states

> that 4 inches of ashes fell at intervals for six days, and there were continuous earth tremors. The beach was lined with pumice-stone floating down the river. Static very heavy, considerable smoke and fire on one night. Muddy showers.

Mr. E. E. Sanders, at Nushagak, reports

> that on June 6th at 7 a.m. static very strong. Heard nothing of Katmai eruption until June 12th, when the air was clear. On Sunday, June 9th, at midnight, flames were seen to the south. This would not bring it in line with the Nak-Nek station. We believed at the time that there were two volcanoes. Intermittent earthquakes occurred from June 6th to June 10th, with the most pronounced occurring on June 8th at 9.32 a.m., our time, lasting 15 seconds. The flames we saw resembled a burning mattress floating up, then to the eastward, then dropping out of sight. Two light showers of ashes occurred, one on June 7th, and the other on June 9th, the latter the heavier. The static charges resembled the roaring of a train with sharp cracks at intervals.

No earthquake or dislocation along a fault line can now occur without being detected by seismographs in various parts of the world. Moreover, no volcanic eruption of marked intensity can now occur without affecting barographs within a radial distance of several hundred miles. And, finally, no great eruption can occur, with its development of atmospheric electricity, without a corresponding electro-magnetic wave disturbance in the ether, shown in the form of static interference on wireless receivers, and more or less pronounced interruption of communication by wireless telegraphy. The time is not far distant when by means of these various records it will be possible for the meteorologist to determine the velocity of propagation of volcanic ash, the detonation or sound waves, the pressure or impact waves, and the duration of thunderstorms and tornadic or whirlwind effects. It will also be possible to account for tidal waves, and, by means of barograph records, time the arrival of marine disturbances of this nature.

It may be pointed out that in the case of vessels equipped with wireless, cruising in the vicinity of volcanoes, the interval between the beginning of static and the hearing of the explosion will give the distance of the volcano. The wireless phenomena are practically instantaneous, whereas the sound waves may be approximately given as travelling at the rate of 343 metres per second (1,120 feet), 12·8 miles per minute, and roughly 772 miles per hour.

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The coast station at Vittoria (Sicily), till now exclusively destined to military wireless communications, has been opened to public service. This station will perform day duty, limited to the working hours of the other Italian North African stations, but the public service may be interrupted if military exigencies require it.

The position of that station is as follows : latitude, 36° 56′ 50″ ; longitude, 14°, 31′ 25″ East Greenwich.

The call letters are I C V.

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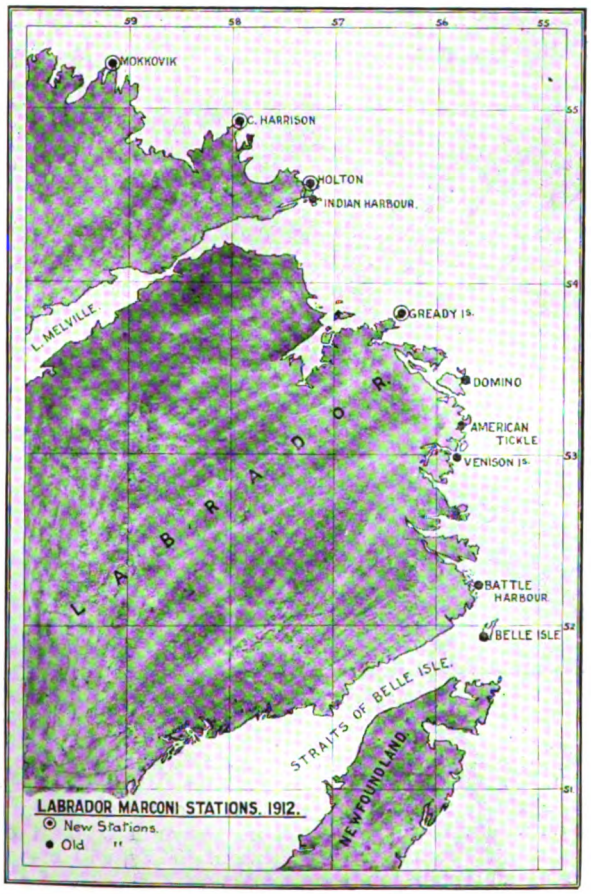
# Wireless on the Labrador Coast

NEWFOUNDLAND can lay claim to a further distinction besides that of being the "senior colony" of Great Britain, for it was on that island that Mr. Marconi received the first wireless signals sent across the Atlantic from England. How an astonished world received the news of this achievement with a large measure of incredulity is now to be recorded among those chapters of history which reveal the frailty of human judgment upon contemporary events. Nevertheless, the conquest of the Atlantic was an accomplished fact, and the great commercial Transatlantic wireless telegraph service which has developed from that beginning is to-day a tribute to the only system of wireless telegraphy which has made possible continuous long-distance commercial working.

These facts lend additional interest to the important agreement which the Canadian Marconi Company have concluded with the Newfoundland Government, and under which the company has been granted exclusive rights for wireless telegraph stations until the year 1926. It is as long ago as 1903 that the first agreement was made under which the parent Marconi Company erected five stations for the Colonial Government. Unexpected difficulties were encountered in the working of these stations, largely owing to the impossibility of obtaining the services of trained operators in the colony. Two years later the Government passed an Act providing that a tax of $4,000 per annum should be levied upon each wireless telegraph station in Newfoundland working on a commercial basis with places or ships outside the colony of Newfoundland. This decision affected the stations of the Canadian Company at Cape Race, Cape Ray and other points in Newfoundland. These stations were then, as they are now, a most important aid to navigation in dangerous waters, and any regulations tending to restrict their sphere of usefulness would undoubtedly be a serious matter.




*Stations on the Labrador Coast.*

However, in the following year a new agreement was entered into under which the Canadian Company undertook to operate all the Labrador stations during the fishing season of each year, the Government to pay the company an annual royalty, and the revenue accruing from this traffic to go to the latter, who further agreed to forward all traffic over the Newfoundland Government Postal Telegraph System.

The success of this arrangement prompted the Government to propose an extension of the system on the Labrador by two or more stations—the Marconi Company to erect and operate these stations on the terms provided in the agreement. In the summer of 1910 stations were accordingly erected by the Marconi Company at Cape Harrison and Mokkovik. In 1911 it was agreed to establish a station between Indian Harbour and Cape

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Harrison to complete the chain on the Labrador.

After further negotiations, an important agreement was executed in December, 1912, which covers the following points: The old agreement terminating in 1916 is extended for a further period of ten years, terminating in 1926; all other undertakings entered into in the earlier agreement will be continued until 1926; the Marconi Company to erect and operate a station at Fogo, on the East Coast of Newfoundland—this station to be the property of the Marconi Company, and to be exempt from the Government tax of $4,000 during the term of the agreement.

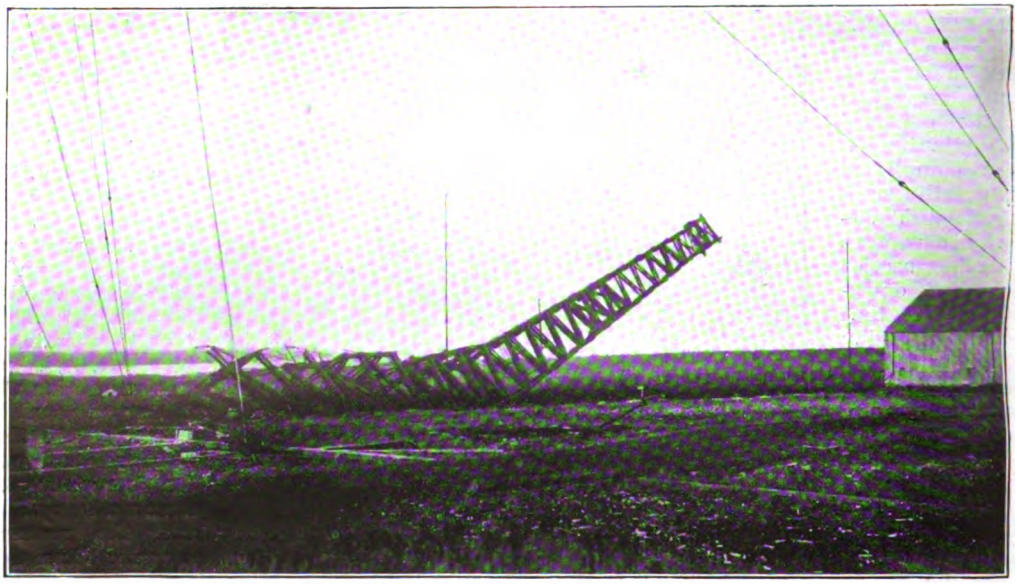
The stations to be operated by the Marconi Company are now: Battle Harbour, Venison Island, American Tickle, Domino, Gready, Indian Harbour, Holton, Cape Harrison and Mokkovik. For each of these stations the company are to receive an annual royalty.

The Cape Race station has probably the finest strategic position of any point on the Atlantic coast of America. A high-power station here would be able to maintain regular communication with steamers practically in mid-Atlantic or within five to six hundred miles off the Irish coast. This would be of inestimable value, and it is therefore obvious that the enlargement and improvement of Cape Race station to enable it to perform these services is a matter that must receive early attention.

The Labrador coast has proved to be one of the most difficult localities for effecting wireless telegraph communication. The rock is very old and exceedingly hard, and being of very high electrical resistance it makes a bad "earth" for wireless telegraphy.

## Canadian Notes

Good progress is being made with the work on hand at Glace Bay, and the duplex station was completed and ready for work during January. Great changes have been made at the old Glace Bay station. The lattice-work towers, which have become almost historical in connection with long-distance wireless telegraph stations, have now been demolished and replaced by more modern steel tubular masts. The Fame Point, Heath Point, Harrington, and Point Riche stations in the Gulf of St. Lawrence have now been closed for the winter season. They will re-open about the middle of May.



*Falling Towers at Glace Bay.*

* * *

It is probable that the erection of stations at Port Stanley, Toronto, and Kingston, on the Great Lakes, will be commenced about the middle of April.

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In December last the s.s. "Easton," plying between Duluth, Minn., and Port Arthur, Ont., ran on a reef near Victoria Island, about

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fifty miles from Port Arthur. She was fitted with wireless apparatus, and was immediately in communication with the Marconi station at Port Arthur, with which station she remained n constant communication until her release on the following evening. What the fate of the vessel might have been in the absence of wireless telegraphy it is not difficult to surmise. Lake Superior in the month of December is invariably exceedingly stormy, and had the "Easton" been unable to summon immediate assistance the vessel would probably have been a total loss, and the passengers and crew drowned.

* * *

The report of the Department of the Naval Service of Canada for the fiscal year ended March 31st, 1912, is issued from Ottawa. The publication, which contains a number of illustrations and maps, devotes a special section to wireless telegraphy; one chapter, headed "Shipping Disasters and the Wireless Services," affording particularly interesting reading. Special mention is made of the mishap to the steamer "Tees." This vessel lost her propeller while at the head of Kyuquoit Sound, on the west coast of Vancouver Island. She sent out wireless distress signals, but owing to the fact that she was entirely surrounded by mountains of the order of 7,000 feet she was unable to establish communication with any station.

The peculiar condition of the ether at night time, however, assisted her, and although she was unable to get an answer to her calls, they were heard by the steamer "Northwestern," away up in Alaska, and by her the news was relayed down to Victoria. At the same time the Government station at Estevan received a piece of the message from the "Tees" saying she was in Kyuquoit Sound. Nothing more was received from the "Tees" until assistance arrived at the scene of the accident five days later.

One of the first vessels on the Pacific coast to instal wireless was the "City of Quebla." On December 17th, 1911, this vessel, while on her way from Seattle to Vancouver, blew out a cylinder head, disabling the ship and severely scalding the chief engineer. Wireless messages were sent from the vessel, and responses were received from the stations at Victoria and Point Grey. It is worthy of note that these two stations, the only ones to respond, maintained a 24-hour watch.

Among interesting instances in which wireless proved of value on the Atlantic seaboard mention is made of the disablement of the British steamer "Berwindmoor." Great difficulty was experienced by the Sable Island station in communicating with this vessel, owing possibly to the fact that no regular wireless telegraph operator was employed on the "Berwindmoor," the wireless being attended to by one of the navigating officers. The "Berwindmoor" was towed into Halifax. During the time she was disabled the owners and the public were kept constantly advised with regard to her condition and the progress she was making.

* * *

Mr. J. Herbert Lauer, the manager of the Marconi Wireless Telegraph Co., Ltd., of Canada, has been interviewed by a representative of the *Montreal Gazette* on the question of the regulation of wireless telegraphy in Canada. Our readers will remember that legislation has been proposed, and the attitude of the Marconi Company towards Mr. Hazen's Act may be summed up in the words of Mr. Lauer:

"We consider the proposed legislation to be a step in the right direction, especially with regard to the control and supervision of any private wireless stations."

Mr. Lauer is of opinion that rigorous enforcement of the clauses imposing penalties on unlicensed amateur stations would have the effect of weeding out undesirable interference with and obstruction of legitimate messages.

In making a comparison of the American Act and the proposed Canadian Act, Mr. Lauer noted that the main point of difference in the two measures appeared at first glance to be that the American Act required two operators on all passenger steamers, whether ocean-going or on the great lakes (coming under Class A) to maintain a constant skilled watch; with modification under Class B. That in the case of cargo steamers with crews of fifty or more, the second of the two operators might be a member of the crew certified as competent to receive distress calls, thus maintaining a constant receiving watch with only a limited transmitting service. The Canadian Bill, however, as drawn up, requires "a person" fully qualified to take charge of and operate the wireless apparatus. A third class is also constituted under the American Act, which embraces classification of vessels voluntarily equipped with wireless apparatus.

Mr. Lauer expressed the opinion that the requirement of the proposed Act of one operator only for the present was commendable, as owing to the difficulty of suddenly obtaining a large accession of skilled operators, heavier demands would make it impossible to supply the number required, such operators not being available at short notice. From the point of view of the shipping companies it was also a wise provision not to make too heavy a call for operators.

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# Wireless Telegraphy in Tropical Countries

## Brazil Adopts Marconi System

THE Brazilian Government has concluded an important contract with Marconi's Wireless Telegraph Company for the provision of powerful stations at Rio de Janeiro, Santa Martha, Bauru, and Ladario, the two last-named being important towns in the Sao Paulo and Matto Grosso regions.

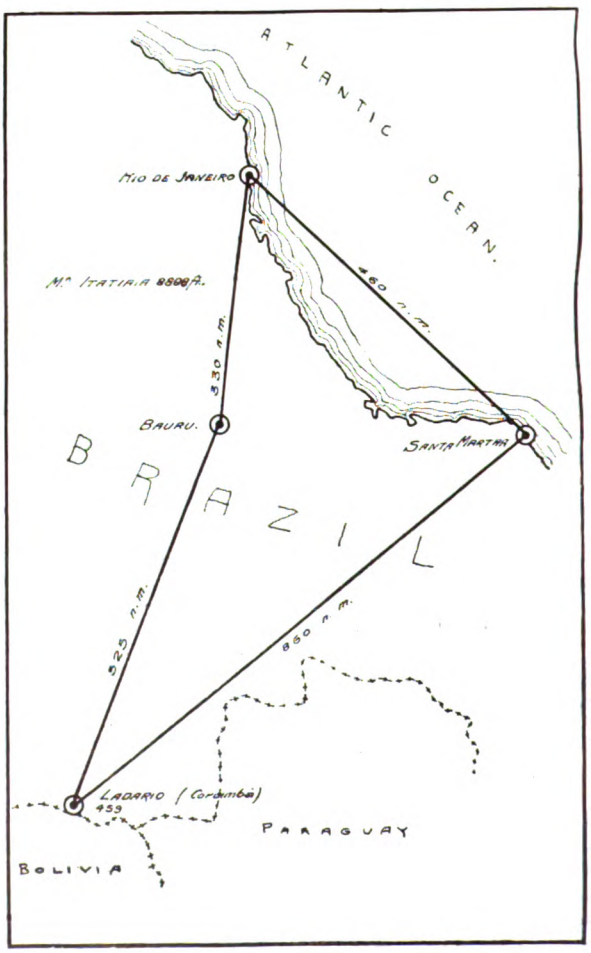
*Dr. F. Bhering.*

These stations will form the southern nucleus of the Brazilian internal wireless network, first proposed by Dr. Francisco Bhering in the course of a lecture before the Engineering Club at Rio de Janeiro on April 2nd, 1912. This lecture was a masterpiece of concise reasoning and lucid exposition of a comprehensive scheme which provides in all for not less than thirty wireless stations, and makes ample provision for considerations of frontier defence, control of the interior provinces, and safeguarding of navigation on the rivers and around the Brazilian coasts. Dr. Bhering referred with approval to some words addressed by the director of Bolivian Telegraphs to his Government in a report dated 1910, in which the fact was emphasised that "wireless telegraphy was a powerful element of national development and the defence of extensive frontiers, and it would put the Government into immediate communication with other Governments in Europe and North America. No sacrifice should be spared to enable the country to realise these facts, which would confer incalculable benefits upon Bolivia."

The scheme adopted by the Bolivian Government for the construction of Marconi stations was fully described in the September, 1912, MARCONIGRAPH.

As to the Brazilian scheme, Dr. Bhering is satisfied that it is urgent, and that it would be extremely useful. Numerous possibilities of communication are provided for. The proposed new medium-power stations are distributed practically over the whole of Brazil, and are so situated in respect to each other that the average working range of each of them would be about 450 miles. The existing stations at S. Luis de Caceres and Bahia will be enlarged, the former so that it may serve to communicate *viâ* Pimenta, Bueno, with the Acre district, and *viâ* Goyaz with Rio and the coast.

The Marconi Company's success in obtaining

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the contract for the four stations now to be erected in the south is the result of the very satisfactory working of the Manaos and Porto Velho stations, which form the northern nucleus of the general scheme. These stations are situated in the tropics on the Amazon River, where severe electrical storms are almost continuous.

Attempts to link up certain parts of the Amazon district by means of ordinary telegraphic lines have all been more or less unsuccessful. Apart from the impossibility of making a profit, and the endless capital expenditure which such arrangements would require, there is further the great difficulty of maintaining ordinary telegraph lines in the extensive uninhabited stretches of woodland, while the transport of materials to build the line in the first place would give rise to numerous complications, owing to the impassability of the roads and the necessity of crossing rivers, swamps, and mountains. Erecting telegraph lines direct through the woods without clearing them would be impossible on account of the difficulties of transporting the necessary materials, and the danger of heavy earths owing to contact with leaves and boughs. Further, in order to prevent severe breakdowns through falling trees, it would be necessary to clear a road to a width of at least 50 mètres on each side of the lines. The vegetation in the Amazon district is so exuberant that, in spite of this precaution, repeated clearing of the twining plants, liana, and shrubs would be necessary every six months, while birds' nests would have to be removed from the wires at frequent intervals.

For these reasons, and because daily inspection would be necessary, especially in the rainy season, when floods and earth movements give rise to constant trouble, the laying of a road or path would be absolutely necessary. The necessity of maintenance and installation troubles would also demand the presence of intermediate stations for the housing of the maintenance staff. Moreover, the difficulties and uncertainty of the work would considerably increase with the length of line, for the further it extended from civilisation, and the nearer it got to trackless and sparsely inhabited districts, the greater would be its difficulty.

Bearing these considerations in mind, it is obvious that only one system of communication is possible in Brazil, and that system is wireless telegraphy. The Brazilian Government have taken the first step in a very large and comprehensive scheme, the progress of which will be watched with interest all the world over.

## Call Letters

THE BUREAU INTERNATIONAL DE L'UNION TELEGRAPHIQUE OF BERNE allots to the various nations who are parties to the International Radio-telegraphic Convention combinations of "call" letters which are in turn allotted to ship and land stations. In consequence of the enormous growth of wireless telegraphy, the necessity has arisen for a revision of the list of call letters allotted to signatories of the Convention, and at present the countries named below have had reserved for their exclusive use the letters which are given against their names :

*Great Britain.*—All combinations commencing with B, G and M.

*Colonies of Great Britain.*—Combinations CAA to CMZ.

*Greece.*—Combinations SVA to SZZ.

*Germany.*—All combinations of letters commencing with A and D, as well as the combinations KAA to KCZ.

*U.S.A.*—All combinations of letters commencing with N and W, as well as the combinations KIA to KZZ.

*Austro-Hungary and Bosnia-Herzgovina.*—All combinations of letters commencing with OAA to OMZ, as well as UNA to UZZ.

*Belgium.*—Combinations ONA to OTZ.

*Brazil.*—Combinations EPA to EZZ.

*Bulgaria.*—Combinations SRA to SRZ.

*Chili.*—Combinations COA to CPZ.

*Denmark.*—Combinations OUA to OZZ.

*Egypt.*—Combinations SUA to SUZ.

*Spain.*—Combinations EAA to EGZ.

*France.*—All combinations of letters commencing with F, as well as the combinations UAA to UMZ.

*Italy.*—All combinations commencing with I.

*Japan.*—All combinations commencing with J.

*Morocco.*—Combinations CNA to CNZ.

*Mexico.*—Combinations XAA to XCZ.

*Monaco.*—Combinations CQA to CQZ.

*Norway.*—Combinations LAA to LHZ.

*Flanders.*—Combinations PAA to PMZ.

*Portugal.*—Combinations CRA to CTZ.

*Roumania.*—Combinations CVA to CVZ.

*Russia.*—All combinations commencing with R.

*Sweden.*—Combinations SAA to SMZ.

*Turkey.*—Combinations TAA to TMZ.

*Uruguay.*—Combinations CWA to CWZ.

There remain, however, the following letters still to be disposed of amongst the remaining countries :

CUA to CUZ, CXA to CZZ, EHA to EOZ, HAA to HZZ, KDA to KHZ, LIA to LZZ, PNA to PZZ, SNA to SQZ, SSA to STZ, TNA to TZZ, VAA to VZZ, XDA to XZZ, YAA to YZZ, ZAA to ZZZ.

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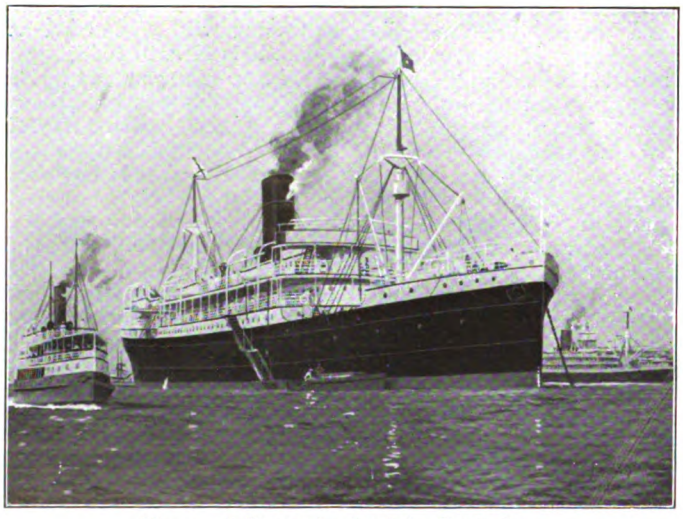
# Wireless Telegraphy for Marine Intercommunication

## A Standard 1½ k.w. Ship Set.

IT was Heine who once referred to Dr. Samuel Johnson as a barrel of British prejudices, and not even the most ardent admirers of the famous lexicographer will gainsay a large measure of truth in the remark of the brilliant satirist. One of Johnson's prejudices concerned the sea; he heartily disliked travelling by sea. "No man will be a sailor," he once remarked, "who has contrivance enough to get himself into a gaol; for being in a ship is being in gaol with a chance of being drowned." During the two days which he and his familiar spent together at Harwich, from which place Boswell was to sail for the Continent, they chanced to enter a church, and Johnson was moved to say, "Now that you are going to leave your native country, recommend yourself to the protection of your Creator and Redeemer." Probably, had the learned doctor lived in these times, he would have overcome to a great extent his fear of the sea; and there is no doubt that wireless telegraphy would have played no small part in reconciling his troubled mind to the safety and comfort of an overseas voyage.



*The s.s. "Christopher," of the Booth Line.*

Wireless telegraphy is now regarded as an essential part of the equipment of ocean-going passenger vessels, and, to a rapidly increasing extent, of cargo vessels and smaller craft. It has reached its present position partly through the sensational evidence of its value to ships in distress, but mainly through the experience gained regarding the general usefulness of an extended means of marine communication.

In the professional circles of the mercantile marine great importance is attached to the fact that wireless telegraphy has destroyed the isolation of ships at sea. Apart from the anxieties thus relieved and the risks of loss and delay thus diminished, there are many economies, in connection with embarkation and disembarkation, which may be arranged now that it is possible to send messages to ships at almost any point of their course. These features do not require labouring, however, for the fact that the list of vessels fitted with wireless rapidly increases—and ample proof of this is to be found in the list of ships fitted with Marconi apparatus which appears each month in these pages—shows that wireless telegraphy has attained an assured position among shipowners, underwriters, and the travelling public.

The development of regular communication between an increasing number of moving stations has necessitated not only a carefully devised organisation, but a uniform method of working. This, in turn, has necessitated a practical standardisation of apparatus. At the same time, the demand for absolute reliability in the hands of ordinary operators has led to the evolution of a type of apparatus which is free from complications and is constructed to work continuously without derangement. Most of the working parts are contained in solid boxes, which protect them from damage and limit the responsibilities of the operator to superficial adjustments and the ordinary business of receiving and transmitting messages.

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The advance in electrical design has been accompanied by a close attention to mechanical detail, with the result that failure on the part of the apparatus itself is practically unknown.

These points will emerge more clearly from the following detailed description of the standard 1½-kw. Marconi set installed on ships. The everyday transmitting range of these sets varies according to the height, length and shape of the aerial, these factors being determined in turn by the dimensions of the ship. When employed with an aerial having a mean height of 100 feet, the installation is capable of working over a range of 200 nautical miles over water, the maximum range considerably exceeding this figure; while the night range may be anything from two to three times the day range according to the conditions of the atmosphere. The 1½-kw. installation is arranged to tune in transmission to waves of 300, 450, and 600 metres, and to tune in reception to all waves between 100 and 2,500 metres.

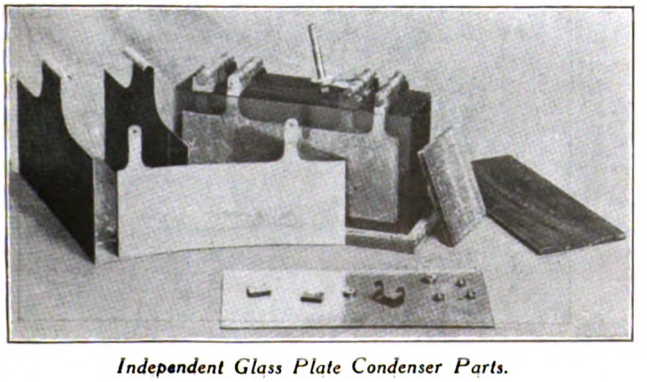
Electric current is obtained from the ship's mains, and led to a converter which supplies alternating current to the main terminals of a switchboard. The low-frequency transmitting circuits consist of an adjustable inductance, the coils of a magnetic relay key, and the primary of a potential transformer connected in series and then to the two-line terminals of the switchboard. This circuit is opened and closed by the main switch, and operated by a Morse key actuating electrically the relay key.

The secondary of the potential transformer connects at the discharger through two air core protecting chokes with the primary high-frequency circuit. The transmitting condenser is connected to one side of the discharger and primary high-frequency tuning inductance to the other side. Between them is connected the primary of an oscillation transformer or transmitting jigger. The secondary of this transformer is connected at one end to the aerial and at the other to the top plate of a spark-gap, the bottom plate being "earthed" by connection with the iron shell of the ship. A tuning lamp and choke are put in shunt with a short length of the wire connecting the jigger secondary to the spark-gap. The transmitting set is completed by an aerial tuning condenser, which is used only when it is necessary to decrease the natural period of the aerial circuit in the transmission of the 300-metre wave.

*s.s. "Tahiti," o the Union Steamship Co. of New Zealand.*

The connection of the receiving apparatus with the aerial circuit is made at the top plate of the spark-gap. From here a lead is taken to the aerial terminal of the tuner, the earth terminal of the tuner being connected to the bottom plate of the sparkgap. The primary terminals of the magnetic detector are connected to the tuner, and the secondary terminals to a telephone and shunting telephone condenser.

It is worthy of note that recent legislation on the subject of wireless telegraphy in the United States and elsewhere insists upon the provision of emergency apparatus guaranteed to work for a certain length of time in case of breakdown or failure of the power plant from which the



*Independent Glass Plate Condenser Parts.*

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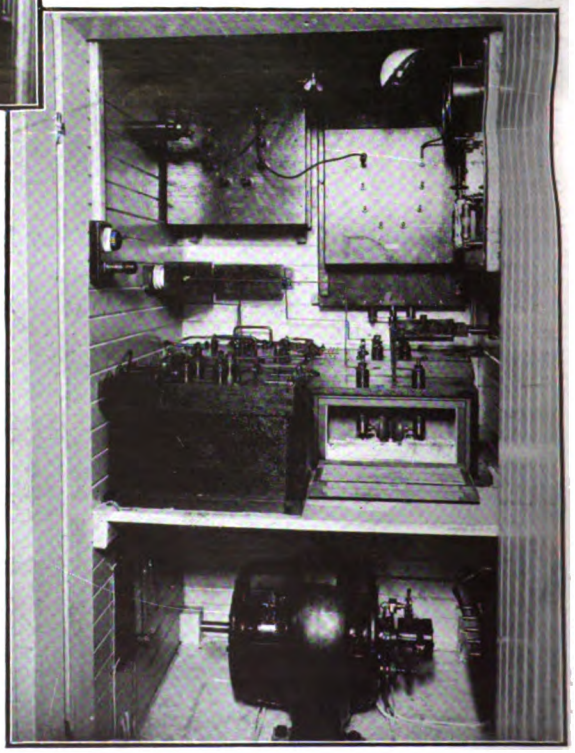
*A Marconi Officer receiving Messages in the "Wireless" Cabin on board ship.*

wireless apparatus receives its electrical energy. In point of fact, this is merely confirming the practice of the Marconi Company, who have always provided emergency apparatus. In this a battery of accumulators, charged by the ship's dynamo, provides current to work an induction coil. A separate key is used for operating; or, in the cases where a special change-over switch is provided, one key is used for operating both circuits.

A full description of the details of the apparatus would occupy too much space, but the following particulars include the salient points about the more important parts of the transmitter.

The spark discharger consists of a pair of mushroom-shaped electrodes, which are of cast-iron, are mounted one each at the adjacent ends of ebonite insulated brass rods, and are placed in a teak silence box 1½ inch thick. The brass rods, with their ebonite insulation, project through the top of the box. Quicklime is placed in a removable zinc tray to absorb the acid produced by the spark. The gap between the electrodes is adjusted by turning the electrodes on their threaded brass supports. A protective point spark gap is mounted on the same pillar below the ordinary discharger. This is generally set for a fixed gap designed to protect the condensers and other parts of the transmitting circuits from the injurious effects of excessive voltage.

The half-plate condenser is in two parts, each with 36 glass plates interspaced with 35 sheets of zinc. Thirty-four (in each part) of the plates are active, the remainder being guard plates. They have a thickness of one-tenth inch, and are tested individually to 27,000 volts. The container is filled with high-flash insulating oil. The capacity of these condensers is 0·065 microfarad, and they are arranged in groups so that they can be connected either in series ro parallel. The primary and secondary windings are provided respectively by



*The Transmitting Apparatus in a Silence Cabin.*

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two coils of heavily insulated wire, the former of one turn and the latter of seven turns. It is at this point that the wave-generating and wave-radiating circuits are coupled together.

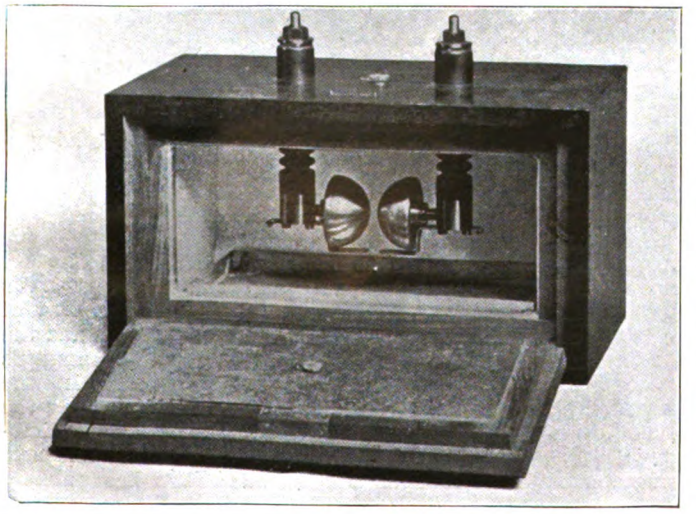
The earth arrester terminal consists of two round brass plates separated generally to about 0·01 inch by discs of mica. The wires to the ship's earth connect with the bottom plate. The top plate is connected to the earth of the oscillation transformer and the aerial terminal of the tuner.

*Earth Arrester Terminal.*

A means of tuning to the incoming signals of one given wave-length, and eliminating the signals of all other wave-lengths, is provided by three inductively coupled adjustable circuits, the first connected to the aerial and the third to the magnetic detector. The full range of 100 to 2,500 metres is obtained in four steps by a triple four-way switch, which simultaneously alters the amount of fixed inductance and capacity in each circuit. Accurate tuning is obtained by an adjustable tuning inductance and variable condenser in all circuits. Injury to the instrument when transmitting is prevented by a micrometer spark-gap, which automatically shunts the aerial terminal to earth.

The magnetic detector in actual use consists of a soft iron wire slowly revolving by means of clockwork around two horizontal pulleys and exposed to the action of two permanent magnets, which magnetise the wire to the critical point. A coil placed in the receiving circuit surrounds the wire at the point where it is under the influence of the magnets, and there is a second concentric coil placed in a telephone circuit. When a high frequency current passes through the first coil it breaks down the hysteresis of the iron wire, which alters the magnetisation. Thus a change in the magnetic lines cutting the second coil is produced, and hence a current is generated in it, causing a sound in the telephone.

The special manner in which the manipulating key is connected places the two front contacts in parallel with the magnetic key contacts, and provides in the side lever key a ready means at the hand of the operator for breaking the primary circuit in an emergency. There are four primary terminals—one of them is not used on this set, the other three have their connections marked on the base. There are in addition two other terminals, which connect to the telephone terminals of the magnetic detector.



*Spark Discharger in Box.*

The single magnetic key will allow the current to be broken at or near zero only, and so decreases the sparking at the manipulating key and increases the speed of operating. Two coils of wire are wound on two boxwood bobbins. These are mounted in parallel on two slotted iron cores fixed to a yoke in the base. A slotted armature is mounted above these cores on a brass arm which carries a contact, and is fixed at one end by means of an adjustable

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stiff spring; the other end bears against an upper stop. When the manipulating key is down the main current flows through the coils of the magnetic key, the armature is attracted, the top and bottom contacts meet and parallel the manipulating key contacts. When the manipulating key is up the magnetic key armature is not released, and the contacts will not break apart until the current approaches its minimum value.

It is practically impossible to give any idea of the extent to which wireless transmission is in operation, not only on passenger vessels, but in the case of cargo boats, cable-laying vessels, lightships, private yachts, and other classes of vessel apart from the navies of the world.

The conditions under which cable-laying vessels have to work make the value of wireless telegraphy very conspicuous in their case. Repairs have to be carried out at long distances from shore, and, as a rule, the vessels have to return to port before instructions regarding subsequent work can reach them, with the result that expensive delays are frequently incurred. An example of the service which wireless telegraphy may render is supplied by the following extract (modified in details of wording) from the log of a cable-laying ship:

"On one occasion we were repairing a cable some 180 miles from the west coast of England, and required further information about electrical tests from the shore. A message was sent and received by another steamer equipped with a Marconi wireless installation and relayed by her on to England, the result being that in less than an hour we had a reply from London giving the desired information, and enabling the vessel to proceed with her cable-laying operations without delay.

"Considering that the inquiry was relayed, and necessitated a careful answer from headquarters, also relayed, the time occupied was remarkably short. On another occasion, when the vessel was on her way home from the completion of a repair off Ireland, a wireless message was received ordering her to the coast of France for another repair, thus saving a useless voyage back to London."

*Marconi Multiple Tuner. For adjusting to various wave lengths.*

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Negotiations have been entered into by the Marconi Company and shipping companies trading to Australia for the transmission of weather messages between ships at sea and the Commonwealth Weather Bureau. The messages received from the vessels will comprise the position of the ship at the time of taking the observations, barometer readings, wind direction and force, state of the weather and sea. The Minister for Home Affairs has publicly acknowledged on behalf of the Commonwealth Government his appreciation of "this public-spirited act."

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# The Imperial Wireless Scheme

ON Monday, January 13th, Sir Albert Spicer, the Chairman of the Select Committee of the House of Commons inquiring into the contract by the Post Office with Marconi's Wireless Telegraph Company, announced that in the course of the inquiry the Committee had been much impressed with the ground of urgency—because it had been pointed out to them from the highest Imperial motives that there was great urgency in the present situation—and they had been impressed also with the difficulties connected with the technical side. The Committee felt that they were hardly competent to deal with the latter side of the question, and, in view of these two considerations, it was suggested that an interim report on those points should be considered. It was decided, however, to leave over the consideration of this report until the Committee had had the opportunity of discussing the matter with the Postmaster-General, and hearing his views thereon. Sir Albert Spicer then read the draft interim report, which, after some slight modifications, was published in the following form the next day :

### The Interim Report

The Select Committee appointed to investigate the circumstances connected with the negotiation and completion of the agreement between Marconi's Wireless Telegraph Co., Ltd., Commendatore Guglielmo Marconi, and the Postmaster-General, with regard to the establishment of a chain of imperial wireless stations, and to report thereupon, and whether the agreement is desirable and should be approved : Have agreed to the following Special Report :

The Committee have heard a number of witnesses from the Government Departments, and have arrived at the conclusion that it is a matter of urgency that a chain of Imperial wireless stations should be established. They also think that, whatever system of wireless telegraphy is ultimately adopted, and whether or no the present agreement, with or without modification, is confirmed, the first six wireless stations should be situated in the countries or places mentioned in the second article of the agreement. They are of opinion that steps should be at once taken to secure sites for wireless stations large enough for a Marconi or any other installation in the countries or places mentioned.

They further think that, with respect to the construction and installation of such wireless stations, especially in view of what has been stated in the course of the present inquiry as to the developments that are said to have taken place in wireless telegraphy during the last few months, the Government must be free to adopt or reject any system from time to time.

Whatever decision may be come to by this Committee with regard to the particular contract under review, or the form of any alternative proposal that may be recommended, it will be necessary for this Committee to come to a conclusion as to the technical and scientific merits of the various systems of wireless telegraphy which are, in their opinion, capable of fulfilling the requirements of the Imperial wireless chain. Under these circumstances the Committee think it desirable to have before them the views of a highly qualified Committee containing eminent scientific experts, and presided over by a chairman of recognised judicial or administrative ability. It would be the duty of such a Committee to report on the merits of the existing systems of long-distance wireless telegraphy, and in particular as to their capacity for continuous communication over the distances required by the Imperial chain. To enable them to do so, they should be empowered to take all necessary steps, by actual tests or otherwise, to satisfy themselves on the above-mentioned points. In view of the urgency of the question, the Scientific Committee should be instructed to report to this Committee as soon as possible, and in any case within three months from the date of their appointment.

This Committee therefore recommend that :

(1) The Government take steps to secure sites for wireless stations in the countries or places mentioned in the second article of the agreement.

(2) The Government appoint a scientific Committee as indicated above.

### The Postmaster-General's Speech

Mr. Herbert Samuel, who was present at the meeting that day, expressed his sense of obligation to the Committee for giving him an opportunity of stating his views, and for having communicated to him the terms of the draft report. With respect to the two points which the draft report raised, he said the Government

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were very glad indeed that the Committee had sanctioned the immediate selection of sites for the stations, but he pointed out that the contract which was entered into contemplated that the contracting company should bear the whole of the risk of any failure of the working of the stations, and he did not think that any company could really be expected to undertake a guarantee of that character unless they had some voice in the selection of the sites. The choice of sites was a matter of considerable importance in the working of wireless telegraph stations, and the Government should not obviously place themselves in the position of enabling a contractor to say that, on account of the selection of sites and on account of some unsuitability in their location, or character of the soil, or other causes of the kind, the stations were not working satisfactorily, and that the fault was due to those who had selected the site. All that could be done, therefore, would be to secure options on suitable sites while arranging for the actual purchase after the company which might secure the contract, if there was a contract, had had the opportunity of expressing their opinion. A suitable site had already been secured on Crown land in England. With regard to Egypt, he would be glad at once to send out a commission, with the co-operation of the Admiralty, for the selection of a site there. It was not intended, he explained, to select the sites of all the stations in the various countries before taking adequate steps for the equipment of the first two. It would be a question of the system extending from Egypt to East Africa, and then probably to India and Singapore, but he would suggest that the subsequent inquiries should take a little longer time.

### The Admiralty's Objection

With reference to the Committee's suggestion that the stations might be erected by the Admiralty, Mr. Samuel said that he had discussed the matter with a representative of the Admiralty, and gathered from him that the Department viewed the proposal that they should be charged with the duty of working these stations with even greater disfavour than they had a year ago. He had also received a letter from the Department in which the Commissioners of the Admiralty adhered to the view that it was not desirable for the Admiralty to undertake the work, and he thought the Committee were aware that the Post Office had neither the staff nor the experience to undertake the actual erection of the stations, and the direct conduct of so large an enterprise.

With reference to the urgency of the scheme, he remarked that there was a danger that the appointment of a technical committee might increase the delay. He gathered that it was the Committee's desire that such technical committee, if appointed, should report by the time that the Select Committee was ready to report to the House of Commons. A further consideration was that the experts would desire to proceed mainly by tests of actual systems. Very probably they would be more or less divided in opinion on technical points, and unless some limit of time was suggested, at any moment when it was desired to come to a decision they would probably find that some system or other claimed to be just at the point of proving itself. In fact, at any time during the next ten years at which a decision was desired it would probably be found that there was some inventor, or some syndicate, or some company which would come forward and say that if only they were given three months longer they would be able to demonstrate the superiority of their apparatus, either in whole or in part, to that of their rivals. Therefore if any Committee was appointed it should be asked to report by a certain fixed date.

### Adequate Practical Tests

There might be a battle of experts in this technical committee which might be infinitely prolonged, and Mr. Samuel suggested to the Committee that the Government would not be justified in entering into any contract, and Parliament would not be justified in sanctioning any contract with any company whose system had not been submitted to adequate practical tests. It was not enough to have experiments in a laboratory or over short range, and he did not think that the State in a matter of this sort should speculate if there was any other course open to it. That had been his view from the beginning. He held that view very strongly still, and on behalf of the Government he urged upon the Committee that the Government ought not to act merely on predictions if there is any alternative and if there was a possibility of practical test.

The question resolved itself down to this: What systems were in a position to submit themselves to adequate test within a comparatively brief period? Other systems which were not able to submit themselves to tests must necessarily be ruled out whether or not a technical committee was appointed, and whatever the theoretical merits of those things might be. He ventured to suggest that in the first instance, at all events, the Committee could ascertain for itself, or possibly the Government if the Committee preferred could ascertain for them, what systems were in a position of being able to present themselves for tests, and what was the nature of the tests

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which they would be in a position to undergo within some such brief period. No experts could be in a position to decide for or against the contract simply on the ground that this or that system appeared to possess merits greater than any other system. For example, would it be in the interests of the State that the contract for these stations which were being erected primarily for strategical reasons should be placed in the hands of any foreign company which was in closest touch with a foreign Government, and which had equipped, let us say, the navy of that foreign Government? Consequently, could a contract be entered into if it embodied a condition that the Imperial wireless station should not communicate with stations of other systems in territories of other Powers? There was also the question as to whether a test made by a technical committee, if one were appointed, say, between California and Honolulu, would show the capacity of an English company to do the same work. The Government, he added in conclusion, attached importance to getting the stations soon—to having stations which could be relied upon to work day and night, and to having complete freedom.

**Marconi Co.'s Letter**

On Monday, January 20th, the following letter from the managing director of Marconi's Wireless Telegraph Company to the Postmaster-General was read:

"SIR,—*Re* contract of the 19th July, 1912, between the Post Office and Marconi's Wireless Telegraph Co., Ltd., and Mr. Guglielmo Marconi.

"When I submitted to your department the tender of the 7th March, my company contemplated that the Agreement would be drawn up forthwith, and that within a very few weeks it would have been submitted to Parliament and ratified. My company, as was absolutely necessary, accordingly proceeded at once to make arrangements to retain in England a very large, responsible, and experienced staff of engineers, and to prepare them to be in readiness to proceed to the different parts of the world to commence the construction of the stations.

"The complete and eventual signing of the Agreement, probably owing to the International Radiotelegraphic Conference, required more time than we had contemplated, but when finally it was signed on the 19th July last, my company were reasonably entitled to expect that it would have been forthwith submitted to Parliament for ratification.

"This course, however, was not followed, but a Select Committee was appointed. In view, however, of the circumstances which prevailed at that time, my company felt that some delay in the ratification of the Agreement was unavoidable. Over three months, however, have now elapsed since the decision of the House to appoint the Committee, and no less than 28 public sittings of that Committee have been held.

"Although many witnesses have been called, the Committee has had no evidence upon questions of long-distance commercial wireless telegraphy from those best qualified to speak with experience upon the subject. Moreover, much of the evidence which has been given, standing alone, and without any opportunity of refutation being afforded to my company, has resulted in erroneous statements, technical and otherwise, being reproduced in the Press of nearly every country in the world, to the serious detriment of my company.

"I gathered at the hearing of the Committee on Monday, 13th inst., that the Committee had prepared a draft interim report which would be immediately submitted to Parliament endorsing the urgent necessity for the construction of the Imperial stations at the earliest moment possible, and recommending the House of Commons to appoint a Technical Committee which should inquire as to which is the best system of wireless telegraphy to be adopted.

"If this question has once more to be considered, my company would welcome in principle the appointment of such a Committee provided proper facilities were afforded for testing the evidence to be called before it.

"It must, however, be borne in mind that even before the 7th March last negotiations with my company were very protracted, owing to the appointment of Committees, technical or otherwise, comprising representatives of the Admiralty, the War Office, and other of the Government Departments, which investigated and considered prior to the acceptance of my company's tender, whether there were any other systems which could be employed for the Imperial stations.

"My company regrets that the proposed Technical Committee was not appointed three months ago, if it was the intention of the House of Commons that the Select Committee should enter into a highly technical and scientific inquiry, as the necessity for such inquiry, if it existed, is not more apparent now than it was then. Already the staff of engineers retained and prepared by this company for the purpose of this contract have been kept idle for many months. The expense to which my company has been submitted in this direction alone is considerable, in addition to which the cost of material has risen substantially since the contract was entered into, and may rise further before any final decision is taken by Parliament.

"The delays which have thus occurred in the

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ratification of the contract were not anticipated by either party to the contract, and it is, I submit, inequitable that my company should remain bound whilst investigations never contemplated should be continued over an indefinite period.

"In all these circumstances, and in order to continue to maintain the company's position here and abroad in an important industry developed in, and conducted from this country, employing over 2,000 British workers, our engineers must be released, and Mr. Marconi and I must be freed to attend to other important work.

"I therefore respectfully request that the Government will agree to the company's treating the contract as no longer binding upon other either party. This course is necessitated solely by the reason of the very serious expense and detriment to which my company is being subjected under the circumstances above explained. It is hardly necessary to say, however, that my company will be prepared, when the investigations are concluded, to devote its whole energy, experience, and staff to the construction of the Imperial stations on such terms as may be then agreed, if the Government should so desire.

"In the meantime, Mr. Marconi and the company's engineers await the opportunity of appearing before the proposed Technical Committee, as they still desire, and have offered to do, before the Select Committee.

"Mr. Marconi, who you will remember became a party to the Agreement of July 19th, at the express wish of your department, requests me to state that he endorses this letter in so far as it concerns him also personally.

"I am, etc.,

"(Signed) GODFREY ISAACS,

"*Managing Director.*"

* * *

QUESTION IN PARLIAMENT.—Mr. Grant asked the Postmaster-General in the House of Commons on January 23rd whether he had yet replied to the communication received from the Marconi Company intimating their desire to withdraw from the proposed agreement with the Government, and if so, what reply was made. Mr. Samuel pointed out that as the contract was under consideration by a Select Committee of the House, he thought it right to communicate the company's letter to that Committee in case they should desire to make any observations upon it. He had not yet received a reply from the Committee, and had therefore not answered the company beyond writing to inform them of the fact that he was sending their letter to the Select Committee. The right hon. gentleman was also asked if no answer would be given to the company until the Select Committee communicated with him, but Mr. Samuel declined to give a pledge to that effect. He said that he must answer the company before very long, and he hoped that the Committee would let him have their views within a short time. Any observations which the Committee might make would be taken into consideration by the Government when they made their reply.

* * *

THE TECHNICAL COMMITTEE.—IN accordance with the recommendation of the Select Committee of the House of Commons on the Marconi contract, the Postmaster-General has appointed a committee "to report on the merits of the existing systems of long-distance wireless telegraphy, and in particular as to their capacity for continuous communication over the distances required by the Imperial chain."

The committee will consist of:

MR. JUSTICE PARKER, Chairman.

MR. W. DUDDELL, F.R.S., President of the Institution of Electrical Engineers.

MR. R. T. GLAZEBROOK, C.B., F.R.S., Director of the National Physical Laboratory, Past-President of the Institution of Electrical Engineers.

SIR ALEXANDER KENNEDY, F.R.S., Past-President of the Institutions of Mechanical and of Civil Engineers.

MR. JAMES SWINBURNE, F.R.S., Past-President of the Institution of Electrical Engineers.

They have been requested, as desired by the Select Committee, in view of the urgency of the question, to report as soon as possible, and in any case within three months from the present date.

## Official Intelligence

COLOMBIA.

The Government of the Republic of Colombia has been authorised by Congress to proceed with the scheme for the establishment of radiotelegraph stations to enable communication to be made between the capital and other centres within the Republic and abroad. The amount voted for the purpose is $200,000.

* * *

DENMARK.

An official report has been issued concerning the working of the posts, telegraphs, and telephones in Denmark. From this we gather that the number of radiotelegraph stations open for public service is sixteen, comprising one coastal station at Copenhagen and fifteen ship stations. In addition thereto several lightships are equipped with wireless telegraph apparatus, but these are employed to answer appeals for help from vessels in distress.

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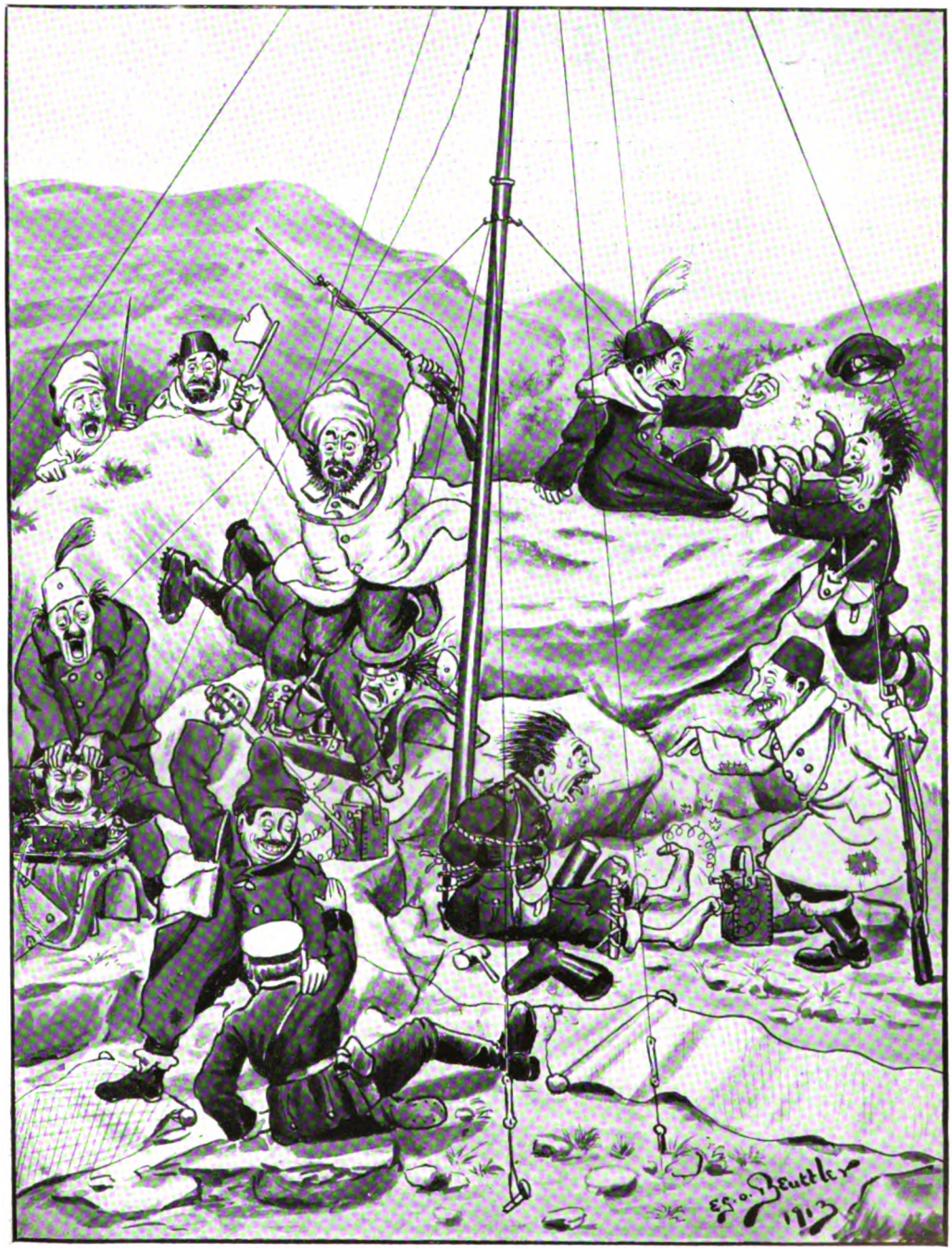

A FIELD WIRELESS STATION SURPRISED BY THE ENEMY

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THE MARCONIGRAPH

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The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

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**OPERATORS, NOTE.**—We are now making up small Receiving Units only, in neat leather cases, approximate size, 10 inches by 9 inches by 3½ inches. Just the thing for your own private use when on leave. Full particulars from **Graham & Latham, Ltd.**, Military Engineers, 104 Victoria Street, Westminster, S.W.

### The Share Market

London: January 29th, 1913.

The market in the various Marconi issues has been somewhat depressed during the past month, the recent fall being mainly due to the nervousness engendered by the political outlook in Eastern Europe.

The prices as we go to press are: Ordinary, $4\frac{5}{16}$; Preference, $3\frac{5}{8}$; Canadian, 17s. 6d.; Spanish, $1\frac{1}{8}$; American, $1\frac{1}{4}$.

### Coltano Station

In the article which appeared in the January MARCONIGRAPH on the Marconi headquarters in Italy, there was a reference to the high-power Marconi station erected for the Italian Ministry of Posts and Telegraphs. The power and range of Coltano, mentioned on page 437 of that issue, were inaccurate, as many of our readers cannot have failed to notice. The power of Coltano is 500 kw., and the range 6,000 kilometres.

### Marconi Patents Upheld in France

Judgment has been delivered in the High Courts of Justice of France in the action for infringement brought by Marconi's Wireless Telegraph Co. against La Société Française Radio-electrique, La Companie Générale Radio-télégraphique, and La Société des Transports Maritimes à Vapeur. The case was heard by three judges—the President of the Court, Judge Bonjean, and the judges Dréfus and Clément. The judgment was unanimous, and its delivery occupied 2 hours and 12 minutes. It covers 137 type-written pages, and constitutes a record for length in the French Courts. In the result, the Court declares the validity of all the claims of the Marconi patent No. 305,060, which corresponds to the English "Four Sevens" patent. All the defendants are declared to be infringers, and an investigation of their accounts has been ordered, to arrive at the amount to be paid as damages to the Marconi Company. The Court further orders the confiscation of all infringing apparatus supplied by the defendant companies, and a perpetual injunction, the defendants to pay the costs.

In giving their decision the judges declared that, despite the good work done by individual scientists, the patent was, without doubt, the first of its kind, and, furthermore, could claim priority, not only as regards practical use, but also on the grounds of its continued advance in the matter of scientific research and improvement. The Marconi Company were perfectly entitled to the patent, which was granted on November 3rd, 1900, on the basis that the practical application of wireless telegraphy was of immense value, in that it had introduced an

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entirely new branch of industry. Their patent had been infringed in France, to the hindrance of justice, by the manufacture of apparatus, and by their installation in a number of telegraphic stations.

This judgment is of the highest importance, and will have far-reaching effects, for the defendant companies have supplied all the wireless installations to all the departments of the French Government, including the Post Office, the Colonies, the Marine, and the Army, which embraces the station of the Eiffel Tower.

### A Share Transaction

An action was heard on January 22nd, before Mr. Justice Scrutton, sitting as a commercial judge, in which Marconi's Wireless Telegraph Company sued Mr. Goukassoff and Mr. Tischenko. The case turned on the construction of certain documents. In October, 1911, there was in existence a company called the Russian Telegraph and Telephone Company of St. Petersburg, in which the defendants were large shareholders. The Marconi Company in September, 1911, entered into negotiations with the defendants with the object of acquiring a controlling interest in the Russian Company. On October 13th a document was drawn up, which was subsequently signed by Mr. Godfrey Isaacs, the substance of which was that the plaintiffs should grant the Russian Company an exclusive licence to use, exercise, and exploit all the patents and inventions which the plaintiff company possessed in Russia, with certain exceptions, upon consideration of the issue by the Russian Company to the plaintiff company of 3,000 fully-paid-up shares of 100 roubles each in the Russian Company. Mr. Tischenko signed a document in these terms on October 16th: "P. O. Goukassoff & Co., represented by myself, hereby bind ourselves by every means to promote the success of the Russian Company of Wireless Telegraphy and Telephony, and not to take any part, directly or indirectly, in other similar companies in Russia. At the same time they hereby bind themselves, in the event of their wishing to sell the shares of the Russian Company belonging to them, of the nominal value of 340,000 roubles, to give to the English Company a preferential right to purchase all those shares on the same conditions, and at the same rate as may be offered for those shares by other persons or institutions."

When this transaction was carried out, the plaintiff company owned shares in the Russian Company of the nominal value of 1,080,000 roubles, out of a capital of 1,800,000 roubles nominal, but under Russian law there were many things which could not be done except by the holders of at least 75 per cent. of the capital of the company. Mr. Tischenko made the Marconi Company an offer to buy shares at 10 per cent. under par. He was in St. Petersburg at the time, and only gave 36 hours for that offer to be accepted there. Mr. Godfrey C. Isaacs, managing director of the plaintiff company, did not accept that offer, and Mr. Tischenko then sold the shares through a Mr. Baruch, who was now asking the Marconi Company to buy them at a premium of 300 per cent.

For the defence it was contended that there was no consideration for the agreement sued upon, and consequently that if there was an agreement binding in law, there had been no breach sounding in damages.

After a hearing lasting two days his lordship delivered judgment in favour of the plaintiffs. He said that in his view the object between the parties was that if the defendants had persons wanting to buy their shares they should give the Marconi Company the chance to take them upon the terms others had offered to give. He found that Mr. George Tischenko, the managing director of the defendant firm, sold the shares after he received the offer he ultimately accepted, giving the Marconi Company the chance to acquire them at the price offered. There would be judgment for the plaintiffs, with £6,000 damages.

### Wireless in Scotland

On the motion for the adjournment of the House of Commons on Tuesday, January 21st, the attention of the Postmaster-General was drawn to a reply which he had given to a deputation which had asked for an extension of underground telegraph wires north of Edinburgh. The question was raised by Mr. Robert Harcourt, and Mr. Herbert Samuel, in reply, said it was one of the most unpleasant duties of a Minister to sometimes have to refuse the sanction of expenditure for which a member asked in the interests of his constituents. He did not minimise the inconveniences caused to Dundee and Aberdeen by the interruption of telegraph communication, but the point was whether the inconvenience was such as would justify an expenditure of £130,000 on the underground wires. One suggestion was that the deficiency should be made good by wireless telegraphy. He pointed out that it was the duty of a Minister to weigh all the proposals and see which were justified. There were many districts in England with no underground cables, and Ireland had none. Scotland had the the benefit of security between Edinburgh, Glasgow, and the west, and he asked members to see what could be done with wireless telegraphy before asking him to press the Treasury to expend the very large sum that was required.

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## Monthly Miscellany

ONE of the most wonderful men now living is Dr. Alfred Russel Wallace, O.M., who on January 8th completed his 90th year. It is not only that he is eminent as a man of science—the man who shares with Darwin the honours of the discovery of the great principle of natural selection is sure of a niche in the Temple of Immortality—but that, having attained the patriarchal age of four score and ten, he is still full of enthusiasm for the cause to which he has devoted his life, and is possessed to all appearance of the energy and the clearness of mental vision of a man of forty. In his beautiful home at Broadstone, in Dorsetshire, he still continues actively engaged in writing and philosophising on the problems of the age, and spurns the delights of leisured ease to which he is so justly entitled. Only recently, discussing affairs with a representative of the *Morning Post* who called to congratulate him on his ninety-first anniversary, he referred in terms of unmeasured admiration on the immense changes brought about in his lifetime through scientific discoveries. Most wonderful of all, he thinks, is the development of electricity in the service of man, culminating in wireless telegraphy. "By means of vibrations in ether," he says, "we now put a girdle round about the earth in forty seconds, instead of Puck's forty minutes, which shows that modern science outstrips even the fancy of the poet."

* * *

Wireless has saved the situation in the Scilly Isles. At this time of the year active business is in progress amongst the growers on these islands, for an important trade is carried on with flowers and hothouse fruits for the early market. Large consignments of narcissi, violets, and lilies of all kinds—and, as regards hothouse commodities, grapes—are sent to Liverpool, Manchester, and other northern towns which are too far distant to allow of the satisfactory transit of such perishable goods from the south of France. As a consequence negotiations between growers and salesmen are actively carried on over the wires. But the recent rough weather has entirely interrupted telegraphic communication, for the heavy gales have resulted in the breaking of the cable at a point seven miles from the mainland. All communication has therefore to be forwarded for the present through the Admiralty's wireless stations.

* * *

Sir George Alexander has recently produced a short play entitled "A Social Success" at the Palace Theatre, London, and the event is noteworthy from the fact that it is his first appearance on the variety stage. But equally noteworthy is the manner in which negotiations were conducted, for Mr. Butt, the Palace manager, was on the way to New York at the time that the negotiations were completed. He had but recently disembarked from the Cunard liner "Carmania," which had had a tempestuous voyage across the "herring pond," and passengers were at some straits to amuse themselves. Mr. Butt had hit upon the excellent idea of whiling away the monotony of transatlantic travel by negotiating by wireless telegraphy with Sir George Alexander, with the result that before the liner arrived in New York he had actually settled the terms and conditions whereby the famous actor is appearing at the Palace. "A Social Success" is a one-act play containing four characters, and lasts about half an hour, and is written by Max Beerbohm.

* * *

A controversy has recently occupied the newspapers on the subject of what boys and girls read, and amongst the correspondents that have taken part in the discussion is Captain Charles Gilson, who in an interesting letter points out the many changes of environment which have affected the standpoint of boy and girl readers in relation to their literature. Only one thing, he said, remains unchanged, and that is the desire for "adventure," which is still the one and only theme capable of enthralling the adventurous period of youth. But, he noted, twentieth-century adventure has shifted its sphere. Red Indians, bushrangers, pirates and discovery of countries were very real a quarter of a century ago. Now, however, they have lived their lives, and their adventures are worn threadbare. For this reason Kingston, Henty and Ballantyne are going rapidly to the boards. Their books sell only because those who buy books for boys remember the tradition of their names. What are now wanted are tales of dreadnoughts, wireless telegraphy, motor-cars and monoplanes, for these are subjects which still possess elements of romance. They bear the stamp of the miraculous, and are themselves concrete proofs of the inventor's imagination, which is the spirit of the age. Nor is there any very great divergence between the wants of girls and boys of to-day in regard to reading matter, for the education of the former has been increased and broadened till, nowadays, it completes practically the whole of the curriculum of the modern schoolboy—not forgetting the attention paid to elementary science; so that the modern girl is able to appreciate a tale on wireless and kindred subjects quite as much as her brothers.

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## Progress in America

THE progress which has been made during the past six months by the Marconi Wireless Telegraph Company of America is explained in a report which was issued early in January. From this it is evident that the progress made has been considerable, for notwithstanding the fact that the company has been engaged in the very big work of taking over the fleet formerly controlled and equipped by the United Wireless Telegraph Company, it has continued its activity in the matter of additional contracts for equipping new boats, both passenger, cargo, and private yachts, with wireless installations.

Considerable success has been achieved in obtaining the cancellation of the old and somewhat unsatisfactory contracts made by the United Wireless Telegraph Company when they were competing with the American Marconi Company; and the great majority of the vessels, all of which have now passed into the control of the Marconi Company, are operating under new contracts upon a sound paying basis, the result of which will be apparent when the next balance sheet is issued.

During the year no less than two hundred additional craft have been equipped with the Marconi system, and it is estimated that no fewer than fifteen hundred vessels are now so equipped, the majority of which contribute traffic to American Marconi land stations.

Traffic returns for ships' correspondence from the Pacific coast, to which the company has only recently directed its attention, show that the net profits for the six months ending September 1st amount to over $25,000 (twenty-five thousand dollars). Owing to the immense pressure of work for new installations, the books of the company in the East are not yet properly written up, but it is estimated that the net profit for the same period will be considerably in excess of those of the Pacific coast; but this period does not fairly represent what the returns will be, for the increased rentals cannot yet be computed.

Very good work indeed has been turned out by the Engineering Department; a contract has been completed for the United Fruit Company of a 50-kw. station at Santa Marta, and further stations at New Orleans and Swan Island are in course of construction. Five stations have been constructed, delivered to, and accepted by the War Department of the United States Government, and other stations are in course of construction for the Government.

Sites have been purchased at Belmar, New Jersey, and at Somerville, for the construction of high-power stations for the American-Anglo Circuit, and at San Francisco and Honolulu for the American-Eastern Circuit, which is destined finally to reach the Philippines and Japan.

All the orders for material have been placed, and the special engineers to whom is entrusted the erection of these high-power stations have been doing their work with great assiduity. The work of construction is now well in hand, and whilst it is too early to prophesy results, the directors of the company are confident that before a year is out all these stations will be in thorough working order, and conducting a large and profitable business.

The recent new Acts controlling wireless telegraphy passed by the United States Government which have required the furnishing of additional operators, and changes and conditions in the apparatus generally installed on vessels, have given great satisfaction to the company. They have not only ensured far more satisfactory working conditions by reason of the non-interference from irresponsible amateurs and others, but have induced steamship owners to willingly pay for the additional advantages which they receive.

Pending the completion of the several high-power stations in construction and to be constructed, the greater part of the additional capital raised by the company during last year has not yet been utilised. Owing, however, to the dearness of money prevailing in the United States, good interest is being earned thereon.

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## Wireless Telegraphy in Mongolia and Tibet

The *Peking Daily News* says that, in order to furnish prompt and reliable information on the development of current affairs in Mongolia and Tibet, it is proposed to instal wireless telegraphic stations in Urga, Uliasutai and Kobdo in Mongolia, and in Chiamdo, Batang and Lhasa in Tibet. This proposal has met with the approval of the members of the Cabinet. The Ministry of Communications has therefore been directed to call in tenders for the construction of these stations.

There is a need for stations in China, especially on the east coast, where there is no coast station between Singapore and Shanghai, and during the typhoon season in September shipping is fraught with very considerable danger.

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## Spanish Notes

The apparatus installed at the Marconi Training School in Madrid is working satisfactorily. Mention has already been made of this school in these columns, and we hope at an early date to publish some additional particulars.

* * *

Operations have already been commenced in connection with the erection of stations at Finisterre and Santander. Work on the Malaga station has also been put in hand.

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# Travel in the Congo

**By Eva Jordan**

TELEGRAPHY in Europe has seldom any difficulties to contend with as regards its smooth running. But in some parts of Africa there are impediments to transmission of messages which do not occur in London. Last year my husband and I decided to travel through the uncivilised parts of the Belgian Congo hunting elephants. We were at the time in British East Africa, and we had to make our way to Uganda, where the real trek'ng started. Of course, telegrams can be sent over that country, but even there the wires are not safe. Let me refer to an article which appeared in the January number of THE MARCONIGRAPH. This article speaks of the Kaverondo tribe, and of their love for copper or steel wire which they took from the telegraph poles. Long before the telegraph line was established there was a great demand for wire, and the traders exchanged this commodity for skins, hide, and ivory. But in Uganda telegraphy by wire meets another antagonist. Large herds of elephants are always roaming about. For some reason best known to himself, my lord the elephant has a very great love for telegraph poles and wire. When he is full of good food, after he has enjoyed a good bath in river or pool, life is very sweet to him, and he proceeds to enjoy it. Like a human being in analagous conditions he goes on "The Hurrah," and his form of amusement is to pull up telegraph poles and curl his hair with the wire. He plays with these toys as we would with a ball, and I expect that next morning he would be very much surprised if he were told of the hundred pounds worth of damage which he had done.

*Nahuri Canoes*

Here steps in wireless telegraphy.

Stations can be established on the trade routes, primarily across country, on lines of latitude. Later on there is a vast field for longitudinal lines, enabling pioneers to maintain connections and so open up the country. It was at first supposed that the wireless system was only suited to marine work. But the traveller in tropical Africa recognises that "wireless" telegraphy is the key to all pioneer work in those regions. Human natives, giraffe, or elephant—nothing can interrupt the messages, and the explorer of woods and forests can keep in touch with the outside world.

But to resume my narrative. After leaving Uganda the wilds of the Congo stretched before us, bounded by the great mountains of Ruwenzuri guarding the frontier. The magnificent stateliness of these everlasting hills is accentuated by the beauty of tropic vegetation and thick forests, while their summits are crowned by perpetual snow. Nowhere in this world can Nature be better seen garbed in all her glory. But the great Congo forest is a hard country to march through. It is peopled by wild tribes of cannibals. It is stocked with herds of buffalo and elephant which have little fear of man. On the native track running from "boma" to "boma" (official posts where there are generally one or two white men) there are always signs of the presence of these

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animals. Trees are thrown across the path, and twice on "safari" we had to wait until a herd of elephants had crossed the track.

In one camp, in which we stayed for a long time, I often watched the elephants crossing the plains below us. Now and then they would scent our camp and approach us. But their better instincts prevailed, and, instead of trampling us into mincemeat, they turned their dignified heads in the opposite direction, and continued their daily round. What appealed to me most was the pretty sight of the mother elephants attending to their young. Sometimes a mother would pass with two babies, the smaller in front being pushed on by "mama's" trunk, while the elder calf trotted on behind. The baby was usually about the size of a Shetland pony.

At this camp a big native chief came to pay his respects to us, and incidentally to gaze on a white woman. We offered him a cup of tea, and at first he was most suspicious of it! He looked at it from all directions, smelt it, and then gave a spoonful to his Lord High Chancellor (or some functionary of corresponding title). The chief watched with eager interest to see if his minister displayed symptoms of the expected agony. Disappointed in this, another Lord High Mightiness essayed a spoonful, and there being no maleficent result, His Majesty the Chief tried it himself. I think he must have thoroughly enjoyed it, as he drank the whole cupfull. Then we entertained our guests with the gramophone, but the chief listened without smile or twitch of muscle. At last we put on one of Lauder's laughing songs. Then a ray of sunshine burst through the clouds which overspread the blank official face and the spell was broken. Oh, the joy of it! Could Lauder only have seen the "ticklish feeling" on those ebony faces he would have sung to them for a week without any salary! Some of the less dignified of the court officials rolled on the floor in their appreciation of Scotch wit—or was it that infectious laugh which carried them away? Future African travellers may take note that a passport signed by Mr. H. Lauder and transmitted to an African chief's court by aid of the gramophone is more likely to ensure a courteous reception than any offering of the tea-cup, which forms the central attraction of London drawing-rooms.

Practically all African natives like the gramophone, but the pigmies proved to be the exception. They were afraid of it. African natives are by no means musical. Their vocal efforts are confined to chants, and half the tonic sol-fa will cover the range of African opera. Musical instruments are usually restricted to two strings, and they have not yet arrived at the state of musical perfection of being able to play "Home Sweet Home" on one string!

From Kasindi, the frontier station between Uganda and the Congo, to Stanleyville is a distance of nearly 1,000 miles by native track. The only communication between these two points is by native runner. From the station of Avakubi, the central "boma" of the march, telegrams, letters, etc., are sent by runner to Toro, on the Uganda frontier, fifteen days' march (which would take a white man at least a month to accomplish) to the *eastward*. A little further on messages are sent *westwards* to Stanleyville, and from there to Coquilhatville, by the Congo river steamers—oh, what dear little pets these river steamers are! They possess everything that can be most desired in the way of dirt and smells.

When we passed through the country between Irumu and Avakubi the natives had risen, not against the Belgians, but in tribal war. Often we heard the sharp report of rifles, and knew that fighting was still going on

*Natives Awaiting Boat*

around us. The natives were ready with their poisoned arrows and spears for any one who might be inclined to molest them. Imagine the position of a white resident there, without any possible telegraphic communication with the coast, and with still less chance of getting a "runner" through.

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# The Wireless Amateur

## U.S. Regulations

THERE has of late been a persistent demand in the United States on the part of the amateur interested in wireless to know where he stands with relation to the new wireless law, and to know whether his station conforms with the provisions of the law. The new law has been set out in full in a recent number of our American contemporary, *Modern Electrics*, but we think it will be useful to present a brief summary of this law so that the public in this country can understand how that much-abused person—the wireless amateur—is controlled in the United States.

Under the new Act it is forbidden for a private person, unless he has a licence, to use transmitting apparatus powerful enough to send signals across the boundaries of the State in which he dwells, or with sufficient energy to be detected by a sensitive receiving set just beyond the State boundaries, or powerful enough to interfere with the reception by others of the signals beyond the State boundaries. The licensed amateur may so transmit messages, but he must not, without special licence, use a wave-length of more than 200 metres, or a power input to his transmitting apparatus of more than 1 kw. If he is within more than five nautical miles of a military or naval station, his wave-length must not be more than 200 metres, nor his power input more than ½ kw. The penalty for operating a station without a licence after December 13th, 1912, is a fine of not more than $500 and the forfeiture of the apparatus.

### Licence for Transmitting Station

Messages may be received from any direction, and on any wave-length, without licence, provided the station is not equipped for sending. If the station is equipped for sending as well as receiving, then the owner must possess both a station licence and an operator's licence, and he is forbidden to permit an unlicensed person to use his sending apparatus except under direct supervision. The penalty for failure to observe the latter provision is a fine of not more than $100, or imprisonment for not more than two months, or both, as provided in Section III. of the Act. For repeated violations of the law the licence is liable to forfeiture.

The sending wave must be sharply tuned, and the fourth regulation requires that " at all stations the logarithmic decrement per complete oscillation in the wave-trains emitted by the transmitter shall not exceed two-tenths, except when sending distress signals or signals and messages relating thereto." This provision sounds rather mysterious, and is not a little formidable, but it is simply a statement of the damping permitted in the wave-trains sent out by the aerial. Amateurs will not often find it possible to plot an actual curve of the current in the aerial, as the only method of determining the value of the logarithmic decrement is by means of a decremeter or some similar instrument, which is sometimes beyond the power of their purse. The limit to the damping is specified in order to provide a wave that may be tuned without much trouble, as it is well known that a wave in which the damping is slight may be sharply tuned and easily tuned out, while a highly damped wave may be heard all along the tuning aerial, and is nearly as loud at one point as at another. If the transmitter is so adjusted that the wave radiated by the aerial does not conform to this regulation an opportunity will be given the owner to readjust it so as to avoid violating the law, which would mulct him in penalties of $100.

### Distress Signals

Absolute right-of-way must be given to distress signals and to messages relating thereto, and the owner of a private station must stop sending if told by a Government or commercial station operator that he is interfering with reception of distress signals or messages relating thereto. The penalty for failure to observe this regulation is a fine of $100, and for repeated offences the forfeiture of his licence in addition. In no case, except in the case of signals relating to vessels in distress, may the private owner use more power than is necessary to carry his messages to the station with which he is communicating or wishes to communicate. He must not divulge the contents of any message he receives or intercepts except to the person for whom such message is intended, or to another station which is to forward the message to its destination, unless required to do so in a court of law. The penalty in this case is a fine of not more than $250, or imprisonment for three months, or both. The effect of this prohibition should be to prevent an amateur from keeping for the inspection of his friends or visitors copies of interesting private messages he may receive or intercept.

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**Wilful Interference**

Wilful interference is one of the principal causes that made Government regulation of wireless communications necessary, and it is interesting to note that the penalty for wilful interference is particularly severe. The owner, or operator, or both, may be subject to a fine up to $500, or imprisonment for one year, or both, for interference with Government or commercial messages, and in all probability the licence would be forfeited for interfering with the work of other amateurs. Severe punishment will be meted out to the person who transmits, or permits anyone else to transmit, while using his sending apparatus, any false or fraudulent distress signals or calls, or any other false or fraudulent signal, call, or message of any kind. The penalty for sending out a false distress signal or call is a fine of not more than $2,500, or imprisonment for not more than five years, or both, for each and every such offence. And the penalty for sending out, or permitting to be sent out, any false or fraudulent signal, call, or message, is a fine of not more than $1,000, or imprisonment for not more than two years, or both, for each and every offence.

The amateur must have a station licence if his station is equipped for sending, and he must also have a licence at least equal to that of a first-grade operator. He may receive messages without either licences if his station is equipped with receiving apparatus only, but he should obtain an operator's licence if he is capable, because an unlicensed person may not operate a sending apparatus in any station except as an apprentice actually serving under a licensed operator for the purpose of learning the art.

## Wireless Regulations

The first person to be arrested on the charge of violating the United States Wireless Act, which was passed early last year, and has recently come into force, is Captain John Hull, who has been indicted on the ground that his vessel did not possess auxiliary equipment sufficient to send a message one hundred miles.

The South African Telegraph Department has made arrangements which will ensure continuous communication between the several ports of the Union. By this means distress signals received at one station can immediately be notified to that port nearest the vessel requiring help.

Examinations of candidates who desire to become wireless telegraph operators are held at the New York Navy Yard, Brooklyn, N.Y., each weekday with the exception of Thursday and Saturday. The examining officer of the electrical class issues government licences to those who successfully pass the examination. Successful applicants then advise W. D. Terrell, radio inspector at New York, when they pass and the serial number of their licence, also the grade.

The United States Court, at Norfolk (Virginia), decided recently that vessels entering American ports for bunker coal only are not subject to the provisions of the U.S. Wireless Telegraph Act, making it compulsory for certain classes of vessels to carry wireless telegraph outfits.

The decree issued by the Government of Uruguay making compulsory wireless telegraph installations on all passenger ships conveying passengers between Uruguay and other ports came into operation on August 15th last. Ocean-going vessels comprehended by this order have to carry an equipment capable of transmitting and receiving messages over a distance of 248½ miles (equal 400 kilometres).

The German naval authorities have devised a scheme for training non-service men as wireless assistants in the shipyard division at Wilhelmshaven. Before entering this division a man must have served an apprenticeship of not less than one year's duration, either in mechanical or electrical engineering, or in telegraphy. Entrance examinations are imposed with a view of testing a candidate's ability in composition (both written and oral), arithmetic, and technical drawing. Testimonials are required from an evening or Sunday class held at the Royal Engineering School; a certificate entitles the candidate to serve only one year. Another necessary qualification is the obtaining of permission for three years' service in the navy, which permission is obtainable from the President of the Reserve Commission.

Prof. James Money recently made the statement before the archæological society in Washington that the Morse telegraph code was not the invention of Prof. Samuel F. B. Morse, but is of Irish origin, being the old Gaelic dot and dash alphabet used as early as the year 1150. "There were seventeen letters in the Gaelic alphabet," said Prof. Money, "and they began with one dash, went up to five dashes, then from five dashes down to one dash, and then began the dots, very much the same as the Morse alphabet used in telegraphy."

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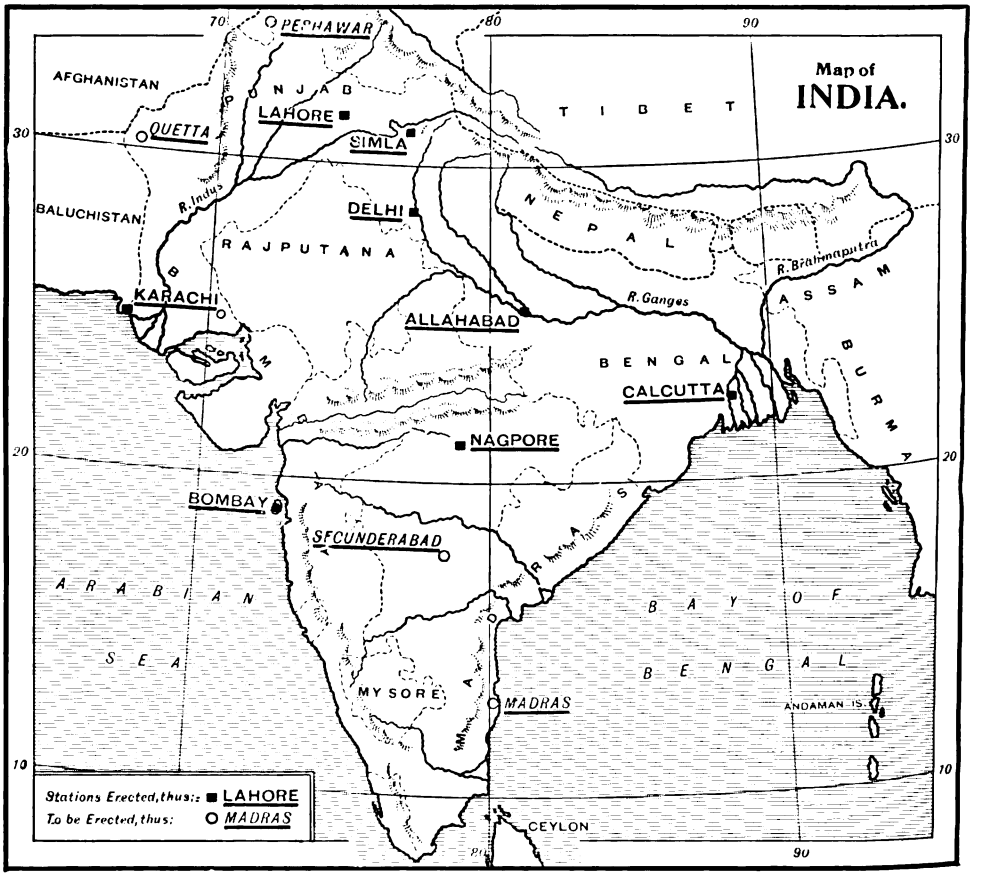
# The Defence of India

## More Marconi Stations

IT is not so long since we described in these columns the noteworthy chain of Marconi stations which the Indian Government decided to erect in order to link up the principal towns and military garrisons of the vast area under its control. The first four stations erected were at Simla, Delhi, Allahabad and Calcutta, but this was only a preliminary move of stations at Madras, Secunderabad, Quetta and Peshawar. The stations about to be erected will probably be placed in fortified positions. Calcutta, Allahabad, Delhi and Jutogh stations are in strongly fortified positions; three of these forts cannot be overcome except by heavy artillery, while the Jutogh station is situated about




*Chain of Stations in India.*

in the more ambitious scheme of establishing a rapid and reliable means of communication between the long chain of outforts extending from Quetta to Peshawar. A little later, stations at Karachi, Bombay, Lahore and Nagpore were put in hand, and now the Indian Government have instructed the Marconi Company to complete the network by the erection six miles from Simla—a district where native risings are unknown. The new stations will be similar in almost all respects to the majority of the existing stations. They will be furnished with the Marconi Company's standard 30 kw. sets, while the receiving apparatus will be of the very latest type.

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# From Yacht to Hospital Ship

## The S.Y. "Mahroussa"

THAT beautiful yacht the "Mahroussa," which is the property of H.H. the Khedive, has been doing praiseworthy work during the Turco-Balkan war in bringing succour to wounded Turkish soldiers. At the end of November last year the yacht was suddenly commissioned to sail for Turkey in the interests of the Red Crescent Mission. She proceeded to Cavalla, a port on the northern extremity of the Ægean Sea, where she remained for nearly three weeks, with a short break, during which she voyaged to Chanak Kilissi, in the Dardanelles.

The "Mahroussa" is equipped with a 5-kw. Marconi wireless set, of the type which is used on battleships. Current for driving the transmitting apparatus is obtained from a battery of 42 accumulators, and there is a variable primary in the jigger suitable for the transmission of wave-lengths of 300 metres and anything between 600 and 1,200 metres.

*Receiving Cabin on the "Mahroussa."*

While at Cavalla the "Mahroussa" maintained regular nightly wireless communication with Port Said, clearing, besides ordinary marconigrams, nearly fifteen hundred words of figure cypher, some of the messages reaching

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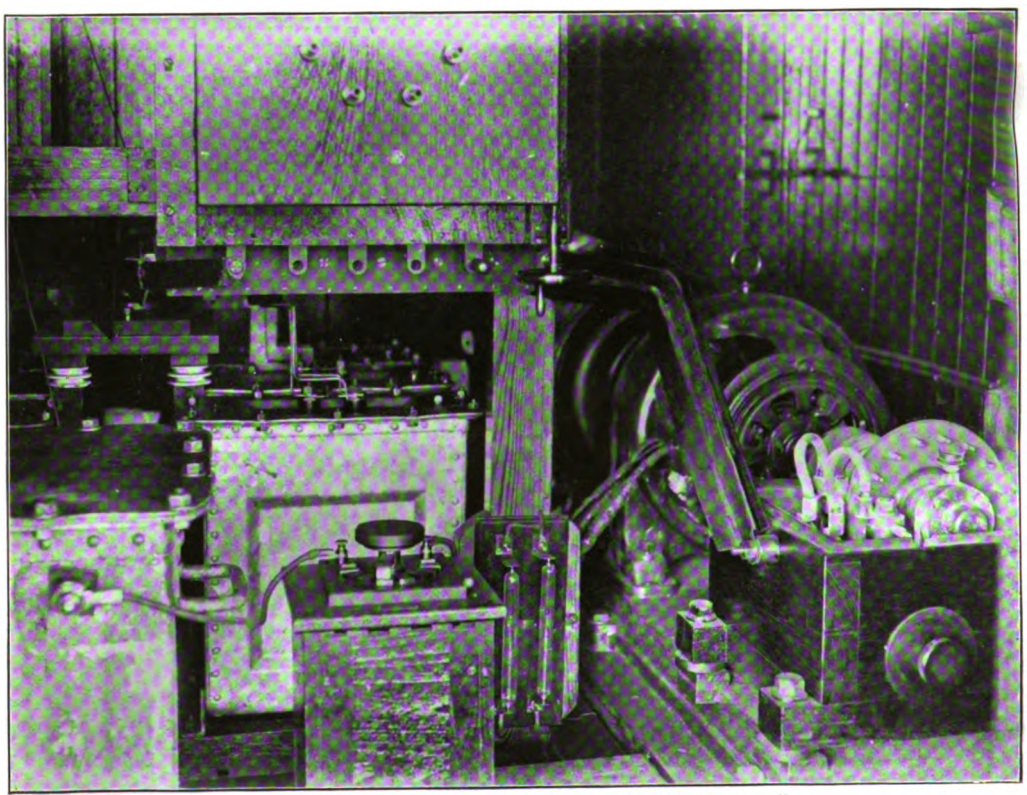
one hundred words each. The distance between Cavalla and Port Said is 685 miles as the crow flies. The island of Thasis, which has an altitude of about three thousand feet, intervenes, and the route traverses the islands of Lemnos and Mitylene, also part of the Asiatic mainland. But the wireless communications continued uninterrupted, and even the operations of the wireless on foreign cruisers outside Constantinople failed to interfere with the successful working of the Marconi apparatus on the "Mahroussa." On some evenings signals were received on board after the sun had disappeared, although it was still light. This work is unusually interesting, and was all done on 3½ kw. Reception was by means of the crystal detector.

The importance of the wireless services can well be gauged from the fact that there was no other means of communicating with headquarters, Cavalla being occupied by the Bulgarians. Before departing on the mission there was a lurking fear among some that the "Mahroussa" would not be able to maintain communication from Cavalla; but this fear was never shared by the distinguished owner of the yacht, whose confidence was based upon previous achievements over a very considerable period, and was amply justified by the splendid results. The "Mahroussa" left Cavalla with 1,800 refugees on board and a crew of over two hundred. There was not a lifebelt of any description on board, and only eight boats.

The accompanying illustrations were sent to us by Mr. J. C. Hawkhead, who was formerly wireless instructor to two Khedivial telegraphists on board the "Mahroussa."



*Transmitting Apparatus on board the S.Y. "Mahroussa."*

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The United States Navy Department announced that the six naval wireless telegraphy stations in Alaska, at St. Paul, Dutch Harbour, Unalga, Kodiak, Cordova, and Sitka, would be opened for commercial business on January 15th, when prepaid messages to ships in Alaskan waters would be accepted for transmission.

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## Correspondence

### Kelvin and Wireless

(*To the Editor*)

SIR,—I have read with interest the letter which appeared on page 396 of your December number, in which the writer refers to Mary Somerville's investigations. In Thompson's "Life of Lord Kelvin," vol. i., page 237, appears the following :

"He (Lord Kelvin) discovered that a critical relation occurred if the capacity in a circuit was equal to four times the co-efficient of self-induction divided by the square of the resistance. If the capacity was less than this the discharge was oscillatory, passing through a series of alternate maxima in opposite directions before dying out. If the capacity was greater than this, the discharge was non-oscillatory, the charge of the condenser dying out without reversing. He suggested that it might be possible, by discharging a Leyden jar or other condenser of small capacity, through a circuit having large self-induction and small resistance, to produce artificially such oscillatory discharges. If the oscillations followed one another too rapidly for the eye to distinguish them, Wheatstone's method of observing them in a rotating mirror might be employed, and would show the sparks as several points or short lines of light separated by dark intervals, instead of a single point of light, or an unbroken line of light, as it would be if the spark were instantaneous, or were continuous or of appreciable duration."

This mathematical analysis may be said to have laid the foundation of the theory of electric oscillations.

Yours, etc.,

C. MASTERS.

### A Strange Occurence

(*To the Editor*)

SIR,—On December 17th, 1912, about 4 p.m., as the ss. "Keemun" was coming out of the harbour, Yokohama, I put on my receivers, and after "listening in" for a few moments, I was very much surprised to hear, in place of the customary Morse buzz, a faint unusual sound of varying pitch, which on "tuning-in," I recognised to be a *human voice singing!* For a few minutes the tune was drowned by the sending of a neighbouring station, but between the breaks, however, the voice was faintly but distinctly audible. When this station ceased transmitting the tune and the words became easily distinguishable, and they proved to be those of the "Village Blacksmith."

Two verses were heard, and towards the end the voice became clearer—possibly due to some readjustment of the transmitter being used, and the final words, "*Like chaff from a threshing floor,*" were as distinct as though from a gramaphone.

Later in the evening I called up the Japanese Government station, Chosi, and asked him if he could suggest who was likely to have been experimenting in wireless telephony, and he replied probably the Department of Communications at their laboratory in Tokyo.

My receiving set is of the ordinary ship type, and as detector I then had a piece of silicon in use.

I thought this would interest you, and so have taken the liberty of writing.

Yours, etc.,

HERBERT S. PEET.

## Question and Answer

*We invite our readers to send us questions, preferably on technical problems, that have arisen in actual practice. To ensure a reply in the current number, such questions should reach the Editor not later than the 15th of the month.*

CROOKHAVEN.—Change of Wave-Length.—"In changing from the 2,000 ft. to the 1,000 ft. wave, why are two arrester-spark gaps used ?"

*Answer:* The arrangement to which you refer is where a 1,000 ft. wave has to be imposed on an aerial whose wave-length, in combination with the jigger secondary, exceeds that value. In this case, the aerial is connected through a certain amount of tuning inductance and through the jigger secondary to earth through an arrester-sparkgap, and also through a capacity of definite size to earth through a second arrester-sparkgap. If you draw out the connections and try and dispense with this second arrester, you will find that you have to connect the lead from the condenser to the same terminal as the lead from the earth side of the jigger secondary, and that then you have a closed circuit, consisting of an inductance (tuning inductance and jigger secondary) and a capacity (the short-wave tuning condenser) between your aerial and your receiving circuits. This circuit has a wave-length of its own, and the result of its presence between the aerial and the receiving apparatus is that when signals of that particular wave-length are being received, some of their energy will be used up in setting this circuit oscillating, generating a back-e.m.f. at the point where the aerial joins the circuit, and opposing the passage of signals to the receiver. It will, in fact, act as a well-known form of "tune-stopper" for waves of that frequency. The use of the second arrester completely insulates the condenser earth-lead so far as received signals are concerned, and obviates this danger of weakening signals of a particular wave-length.

[*Other questions reached us too late to be dealt with in this issue, and replies will appear in the March* MARCONIGRAPH.—ED.]

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## Contract News

The following vessels will be equipped with apparatus for wireless telegraphy by the Canadian Company :

S.S. "Aranmore," owned by Messrs. HOLLIDAY BROTHERS, QUEBEC.

S.S. "Lintrose" and "Kyle," owned by the REID NEWFOUNDLAND RAILWAY COMPANY.

The American Marconi Company have received an order from the UNITED STATES MILITARY AUTHORITIES for a 1-kw. high-frequency set.

The Canadian Government have decided to instal at Port Arthur and Sarnia, Ont., standard duplicate 5½-kw. Marconi equipments.

**The following Vessels have been equipped with Marconi Apparatus.**

| Owners. | Name of Vessel. | Installation. | Remarks. |
|---|---|---|---|
| The British India Steam Navigation Co., Ltd. | s.s. "Arankola" ... | 1½ kw. and emergency set | Passenger between England and India or Australia |
| " " " | s.s. "Elephanta" | 1½ kw. and emergency set | Passenger between England and India or Australia |
| The White Star Line ... | s.s. "Cufic" ... | 1½ kw. and emergency set | For service between America and Australia and New Zealand |
| " " ... | s.s. "Tropic" ... | 1½ kw. and emergency set | For service between America and Australia and New Zealand |
| " " ... | s.s. "Arabic" ... | 1½ kw. and emergency set (refitted) | For Atlantic service |
| Andrew Weir & Co. (Bank Line, Ltd.) | s.s. "Naueric" ... | 1½ kw. and emergency set | General trade |
| New Zealand Shipping Co., Ltd. | s.s. "Tongariro" ... | 1½ kw. and emergency set | Coast trade in New Zealand |
| Ellerman Lines (Bucknall s.s. Line) | s.s. "Bulawayo" ... | 1½ kw. and emergency set | Passenger between England and S. Africa |
| " " " | s.s. "Saldanha" ... | ½ kw. and emergency set | Trading between England and S. Africa |
| Ellerman Lines (City Line) | s.s. "City of Glasgow" | 1½ kw. and emergency set | Passenger between England and India *via* Suez Canal |
| " " " | s.s. "City of York" | 1½ kw. and emergency set | Passenger between England and India *via* Suez Canal |
| Ellerman Lines (Hall Line, Ltd.) | s.s. "City of Durham" | ½ kw. and emergency set | Trading between Eng'and and Bombay and Karachi |
| Watts, Watts & Co., Ltd. ... | s.s. "Willesden" ... | ½ kw. and emergency set | The first of a big fleet of cargo vessels owned by this company to be fitted with wireless. Destined for Honolulu |
| Gellatly, Hankey & Co. ("Mogul" S.S. Co.) | s.s. "Ghazee" ... | ½ kw. and emergency set | — |
| Societa Nazionale di Servizi Marittimi | s.s. "Firenze" ... | 1½ kw. set | Sailing between Genoa and Alexandria |
| Guyton & Co. ... ... | s.s. "Pettibone" ... | ½ kw. set | Barge |
| The "Heroine" Co. ... | s.s. "Heroine" ... | 1½ kw. set | — |
| Geo. J. Whalen, Esq. ... | s.y. "Cassandra" ... | 1½ kw. set | Private yacht |
| Hubbard Steamship Co. ... | s.s. "General Hubbard" | 1½ kw. set | — |
| Inter-Ocean Steamship Co. | s.s. "Borgestad" ... | 1½ kw. set | — |
| Arrow Line (Swayne, Holt & Co.) | s.s. "Apraiso" ... | 1½ kw. set | Pacific Coast service |

**Orders have been received to equip the following Vessels with Marconi Apparatus.**

| Owners. | Name of Vessel. | Installation. | Remarks. |
|---|---|---|---|
| P. & O. Steam Navigation Co. | s.s. "Benalla" ... | 1½ kw. and emergency set | Building |
| Burns, Philp & Co., Ltd. ... | s.s. "Morinda" ... | 1½ kw. and emergency set | General trading |
| New Zealand Shipping Co. | s.s. "Rimontaka" | 1½ kw. and emergency set | Engaged in general trade on New Zealand coast |
| " " " | s.s. "Paparoa" ... | 1½ kw. and emergency set | Engaged in general trade on New Zealand coast |
| Union Steamship Co. of New Zealand | s.s. "Wahine" ... | 1½ kw. and emergency set | For service between America and Australasia |
| Union of South Africa ... | s.s. unnamed ... | 1½ kw. and emergency set | Destination undecided |
| White Star Line ... ... | s.s. "Ceramic" ... | 1½ kw. and emergency set | General trading with Australia |

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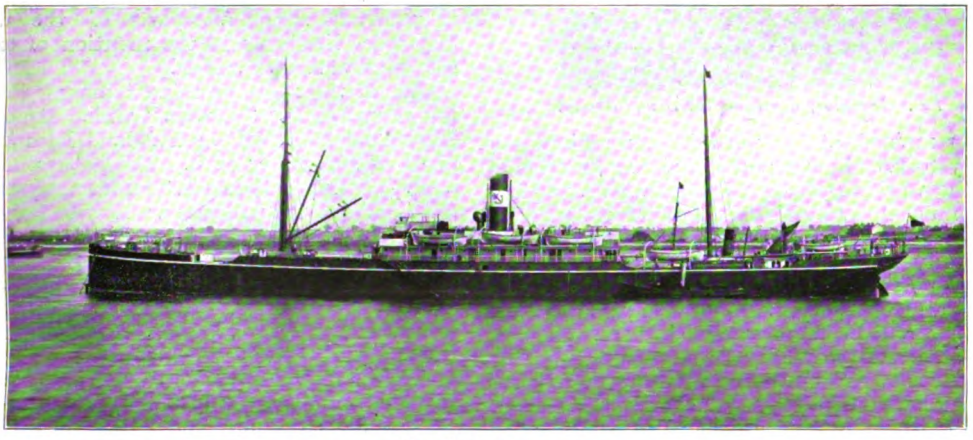
# Maritime Wireless Telegraphy

*There has been a severe roll of maritime disasters during the wintry gales of the past month, and almost the whole of this section is on this occasion occupied with a record of the services rendered by wireless telegraphy. Pressure upon our space has rendered it necessary to hold over our usual miscellaneous record of maritime news.*

FEW winter storms have equalled in violence that which swept over the whole of Western Europe on December 26th and 27th last year. It had its origin in the Atlantic, but its full force prevailed in the English Channel, the Bay of Biscay, and other adjacent coasts. It was not to be expected that such a gale would be unmarked by shipwreck, but the list of vessels damaged is, under the circumstances, comparatively light.

On December 24th the s.s. " Narrung " left Tilbury bound for the Cape and Australia with two hundred and forty-eight passengers—mostly emigrants—on board. She encountered the full force of the gale in the Bay of Biscay, and it was only the good seamanship of the captain and his officers and crew which brought her out of her perilous position. While she was still in the Channel the seas were running high, and she suffered a good deal of buffeting, but when she was twenty miles off Ushant her position had become one of great danger. Huge waves were sweeping the decks, one in particular—estimated by the ship's officers to have been seventy feet high—entirely enveloped the vessel. It wrecked all the tackle in front of the mast and flooded all the passengers' accommodation in that part of the vessel. It carried away the winches and broke in through the hold, while the iron deck was ripped up and crumpled back. It was then that the captain recognised the futility, and, moreover, the impossibility, of continuing the voyage, and determined to turn back. But think of it—reversing engines and presenting a broadside to the fury of the gale! So imminent was the danger that it was thought advisable to send out a wireless message for help, and two steamers—the " Bavaria " of Hamburg and the " Negada " of Guadeloupe—intimated in response that they were steaming full speed to the rescue, and within a short time Lloyd's sent out the following message from their signal station at Horse Sandfort :



*The S.S. Narrung.*

> The British steamer " Narrung," London for Sydney, steaming north-east at 10 knots, requires immediate assistance. The " Bavaria " and " Negada " are proceeding to her assistance. A wireless message from the captain states that the " Narrung " put back with her fore deck swept,

and shortly after the French Government replied from Cherbourg offering to send a gunboat to the assistance of the distressed vessel.

The difficult manœuvre of turning round in the teeth of the gale was successfully accomplished, and occupied an hour and twenty minutes in the doing, while it was not till four o'clock—or five hours after—that the

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worst of the danger was over, then, steaming before the gale, the "Narrung" made its way towards safety. As soon as Captain Bidwell found that he could make the return journey unaided he sent a message to that effect in answer to the advices received from numerous vessels that were hastening to his help.

All this time the wireless operator (Mr. H. A. Reynolds) was fully occupied in the Marconi room receiving and sending the various messages.

*Mr. Reynolds, Operator on the Narrung.*

He remained at his post for something like forty to fifty hours, and it was the knowledge of the working of the wireless apparatus that did much to allay the fears of the passengers.

After the task of turning had been satisfactorily accomplished, a quick running of four or five hours enabled the vessel to reach comparative safety, and it was only a question of time and brilliant seamanship that effected the stages of the "Narrung's" return.

At seven o'clock in the morning of December 28th the liner dropped anchor off Gravesend, weather-beaten and dishevelled, but with every soul on board safe. All's well that ends well.

*Electrical Engineering*, commenting upon the "Narrung" experience, states: "The fact that the wireless equipment was able to remain in operation throughout the exceptionally boisterous weather experienced in the Bay of Biscay on Saturday last speaks volumes for the solidity of the mechanical and electrical construction, especially that of the aerial. We understand that the equipment is the standard 1½-kw. emergency set supplied by the Marconi Company. The aerial is of the standard twin type, and is 200 feet long, supported between the two masts."

The terrific gale which swept the north-east Atlantic towards the end of last month has been followed by an endless succession of cyclonic disturbances travelling east and north-east from Canada, the Straits, or the Gulf of Mexico. Such storms have not been experienced for over thirty years, and shipping has greatly suffered thereby. The British Isles have felt, in a minor degree, the influence of the disturbances, although few of the cyclone centres—that is to say, the danger zones of the storms—have reached these shores. The centres of many of them have been exceptionally deep, records from ships showing that on quite a number of occasions the barometer has dropped as low as 28½ inches. But this was not the lowest measurement, for on one occasion the Meteorological Office reported a cyclone with centre in Lat. 50 deg. N., Long. 25 deg. W., which reached the abnormally low level of 27½ inches—a reading scarcely ever registered in any part of the world.

As a result Lloyd's underwriters have had an anxious time, and wireless telegraphy has been not only in constant use to allay suspense, but has been the direct means of saving a number of vessels, which, but for this aid, must have inevitably perished. Such rescue is reported from all parts of the world, but space limits us to the mention of only a few outstanding examples.

One of the most prominent among these is the rescue of the "Oravia," which struck the Billy Goat Rock off the Falkland Isles on the night of November 12th. The occurrence has already been mentioned in THE MARCONIGRAPH, but details of the incident are now to hand.

At the time of the collision a number of the passengers were up, waiting until the ship had anchored for the night, as it was too dark to enter Port Stanley. There was great consternation, therefore, when, instead of hearing the anchor let go, they felt the ship strike with great force. The passengers were told to clothe themselves warmly and put on lifebelts. The weather was bitterly cold. The bell was rung for boat stations, and the lifeboats were swung out. The captain was on the bridge. In reply to a wireless message, the Governor of the Falkland Isles sent word that the gunboat "Sampson" and several whalers would leave immediately for the scene. An hour after the ship had stranded the lights of a vessel were seen. It was a cheering sight to the 261 passengers huddled together on deck, for they realised that the ship was in a very precarious position, and might at any moment slip off the rock and sink in deep water. But owing to the rough sea none of the boats could come alongside, and, to make matters worse, the wind increased in violence and a thick rain set in. Four lifeboats were lowered and filled with women and children, who were transferred to the whalers. Presently the Government launch "Penguin" managed to work alongside, and the remainder of the women and

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children and some men embarked in her. The "Sampson" next got alongside. The remainder of the passengers, 200 in number, were then embarked and taken to Port Stanley. The captain, officers, and crew remained in the "Oravia," and after the passengers had left the mails and baggage were got up on deck. All this time the ship was grinding on the rocks, her stern being afloat. Heavy seas caused her to strain badly, and the water-tight bulkheads gave way. Later in the day the boats brought the mails and baggage ashore, and in reply to an urgent message, sent by Captain Poole to the wireless station, the "Sampson" brought off the crew, officers, and Captain Poole, who was the last to leave. The passengers were surprised to find that nothing was lost, even the loose clothing being bundled together and labelled with the number of the cabin they were taken from.

. . . . .

The British steamer "Alcazar," with a crew of 23 aboard, has had an uncomfortable experience. On December 26th the steamer "Dorchester" picked her up after she had been reported abandoned. It was found that her cargo had shifted, and she was towed into Beaufort, North Carolina, where the owners' agent took her over, the cargo restowed, and the ship again taken in tow. But later, on January 9th, she sent a wireless message from the Diamond Sholes Lightship, saying she was adrift and leaking. The British Vice-Consul immediately called for assistance, and every effort was made to reach the distressed vessel. But shortly afterwards her position became less perilous, and she was able on the following day to enter Norfolk Harbour, Virginia, under her own steam, but with a bad list to port.

. . . . .

On January 12th the British steamer "Uranium," bound from Rotterdam to Halifax, N.S., and New York, with 883 passengers and a full crew, crashed on to the rock-bound coast near Chebucto, twelve miles from Halifax. The vessel, commanded by Captain Eustace, struck the reef in a dense fog; there was a heavy south-west wind blowing, but she was protected by the headland. Had the gale been from the north-east, the vessel would have been exposed to the mighty sweep of the Atlantic, and could not have withstood the terrific pounding long enough for help to arrive. As it was, the "Uranium" was able to send an appeal by wireless, and within four hours from the time she struck, the "Lady Laurier," a Canadian Government steamer from Halifax, reached the scene of the disaster, and safely took off every passenger. The captain and crew refused to forsake the stranded liner. The "Uranium" hit the reef at 11 a.m. with a terrific crash, and momentarily her 700 odd passengers were thrown into panic. The officers and crew, who throughout behaved with great courage, soon quieted their fears, and despite the horrible sound of the broken steel plates grinding on the rocks and the icy water sweeping the decks from stem to stern, the passengers commenced to collect their luggage and await the coming of assistance.

As the "Lady Laurier" came slowly out of the mist towards the shipwrecked passengers, they gave a cheer, which even the roar of wind and wave could not stifle, and the work of rescue began immediately.

Every man, woman, and child of the 883 passengers safely reached the "Lady Laurier's" deck, and all were transported without mishap to Halifax.

. . . . .

Perhaps the most dramatic of situations is that in which the "Veronese" found herself on January 16th, when she had accomplished but a mere fraction of her intended voyage. She was a vessel of considerable importance, for she carried 300 souls aboard, and her cargo was underwritten to the amount of £150,000. The "Veronese" was bound for Brazil, and had only just passed Leixoes harbour, which is practically a suburb of Oporto, when she ran on the Boa Nova Rocks. At first it was thought that she would be a total loss as, though firmly embedded on the rock, she was breaking slowly in two, and the starboard side was completely awash. After a slight delay caused by the difficulty of working conditions, she got into wireless communication with the shore, and the Government immediately sent gunboats to her aid, while the Argentine steamer "Hollandia" stood by her in order to render assistance. But the violence of the storm made communication other than by wireless impossible, and it was only after many hours' struggle that the shore station succeeded by means of its rocket apparatus in getting out a life-line to the wreck. Then the work of rescue proceeded apace, despite the desperate weather which caused the landing cable to break frequently, and by the morning of the 19th all that could be saved were saved. That some of the passengers were past help was already known, for a wireless message from the "Veronese," sent soon after the disaster, reported that fifteen deaths had occurred owing to passengers being swept away in the heavy wash of the seas. That any loss of life should have occurred is to be deplored, but there is no doubt that without wireless telegraphy, whereby the shore stations knew exactly the position of affairs on the wreck, and so were able to make plans for the rescue and relief of the unfortunate passengers, the death roll would have been greatly increased.

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# Life as a Wireless Telegraphist

THE varying incidents in the career of a wireless operator always make interesting reading, and the article which adorns a recent number of *Chambers's Journal* is no exception. The name of the author is not given, but he has evidently had a fairly lengthy experience, for he refers to the time when wireless was not in such common use on board ship as it is at present. His first experience as a wireless operator was on board a liner. He tells us that he had gone through a short period of training with wireless work, which together with his previously acquired knowledge of ordinary telegraphy was supposed to render him thoroughly competent for any duties. We are not surprised to learn that the writer was soon disillusioned, for anyone who imagines that he has merely to don an operator's uniform to become a proficient telegraphist will speedily awaken from his nightmare if he will but turn over the file of THE MARCONIGRAPH and read the article which appeared in the October (1911) number on the operating side of wireless telegraphy as a career. Moreover, some of the experiences which befell the writer of the article demonstrate the pitfalls for the insufficiently trained telegraphist.

### Conducting Business from Mid-Ocean

A short time ago the writer of the article in our contemporary met with an experience which shows the great utility of wireless telegraphy. The vessel had left Liverpool about half an hour, when an elderly gentleman went up from the cabin and asked the operator if he could get a message through at once to his office in London. The message was to the gentleman's junior partner in the City and was in code, so the operator did not understand it, but later the gentleman informed the operator that he had obtained from one of the passengers an important item of information concerning a certain firm in the City, and it was of such a nature as to make him very anxious to prevent his partner from engaging in a big transaction with the firm in question which he contemplated doing. By the aid of a wireless message the senior partner, though miles out at sea, was able to warn his junior of the danger of doing business with this firm and thus saved both himself and his partner from losing a great deal of money.

On another occasion a well-known English theatrical manager, who was going to America with a view of purchasing the rights in certain plays, got into communication by wireless with the playwright when the vessel was 300 miles from New York, and long before the vessel entered the harbour the theatrical manager had secured the rights in the plays he required.

Another story is told that in the early days of wireless telegraphy the captain of a liner wanted to signal to another vessel which he knew ought then to be within 50 miles of him bound for Southampton. The operator signalled her, but the receiver did not record a reply, and he was in the act of testing his apparatus when he suddenly received some signals. Thereupon the captain, who was in the operating cabin at the time, exclaimed: "There they are; we have got them at last."

"We are the 'Minerva,'" ran the message, "we are operating experimentally. Please reply." Then came a full stop, and the message was repeated again. The liner acknowledged it, but still the same message came running off the tape. After it had come through a dozen times the captain of the liner got into a furious rage. "Tell them," he exclaimed, "to chuck the machine overboard. Ask them who let them loose. Tell them to work for Colney Hatch." "I cannot tell them anything," replied the operator. "I think their receiver must be out of order, though they do not seem to know it; but it must be or they would have received our reply and acknowledged it."

### An Unlicensed Operator

One night, a little while after, the same vessel expected to be called up by a liner passing some 30 miles east of her. The operator was in his cabin about the time when the call was expected, and the captain came in to ask if there was any news. Almost at the same moment the tape began to come very slowly in jerks from the printer. "There you are," said the captain, "unless we have been picked up again by some experimenting pirate. That ought to be the liner. Get your reply through quickly, for I believe she has one of our directors on board." The signals were, however, utterly unintelligible. "I don't think it's the liner," answered the operator, "it seems to me a queer jumble of signs and letters. However I will answer them anyway." When the telegraphic key of the transmitter was depressed a big blue spark flashed out between the polished brass knobs on the coil. "What ship is that? We are the 'X' bound for New York." But no response came through, nothing but a mysterious jumble of letters that came out on the tape in jerks. "It is just possible," remarked the operator to the captain, "that we have picked up a message in code passing between two men-of-war."

On arrival at New York a most elaborate examination was made of the apparatus, when it was found that a big beetle was crawling about the relay of the receiver, and the dots and dashes were nothing more than a record of his wanderings in a place where he had no right to be.

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# "Heroes of Science"

MUCH has been done of late to popularise science, and as a result the interest in scientific discovery is practically universal. Nevertheless there still remains much to be done. And in this way: While the minds of those who have a scientific bent are fostered diligently and books of unlimited variety minister to their needs, little is done to bring the unscientific—by antithesis it might be called the "artistic"—mind into harmony with the distinctly scientific trend of the times. That is why Mr. Gibson's book* is particularly to be welcomed, for it does a great deal towards breaking down the barriers which divide these two natures. Its subject-matter is of common interest, and affords a ground where these two classes of readers can meet on an equality, and for that reason, if for none other, it should command success. Primarily the book is intended for young people, and the author, keeping his purpose well in view, has adopted an admirably simple style of writing. There are no "frills" of diction, nor any unnecessary wanderings from the subject in hand; the sentences are short and lucid, while the grouping of incidents into paragraphs has been raised to a fine art. Consequently the youthful reader can focus his entire attention on the story brought to his notice.

FARADAY GIVING HIS CARD TO FATHER THAMES;

And we hope the Dirty Fellow will consult the learned Professor.

If he be of the artistic temperament before alluded to, he will be fascinated to find that the men who made science were not the mere dry automata he took them to be when at school, or supermen "too great or good for human nature's daily food," but were very companionable heroes, who could crack a joke and enjoy life with the rest of us. By this means sympathy for the man's work is evoked, and this is the surest method of awakening in the mind of the child a vital interest in his studies.

But take the boy or girl who has an aptitude for the sciences; the chances are he may know a lot about the theory of evolution, and nothing at all about Darwin—the man—except as a cipher. He may write an interesting essay on the dynamo, while he could not put together a single sentence about Michael Faraday. To him the lives of these heroes of science would be a revelation, and the perusal of such a book as this would give him a broader outlook on his hobby, and teach him to realise the great truth that the be-all and end-all of science is not merely knowledge, but the betterment of mankind.

Among the "lives" in this book, one of the

* "Heroes of Science," by Charles R. Gibson. London: Seeley Service & Co. 5s.

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best written is that of Clerk Maxwell, for it gives us a charming glimpse of the private life of one of Britain's greatest scientists. As has been pointed out in an earlier number of THE MARCONIGRAPH, Clerk Maxwell's career is of particular importance to those who are interested in wireless telegraphy, for it was he who established the fundamental laws of motion and electro-magnetic waves, and so paved the way for Hertz to demonstrate their actuality to an astonished world. In this connection a letter has been included by his biographer, from which we take leave to quote. It contains references to Lord Kelvin, who was then a young man known only as Professor Thomson, and reads :

" I was writing great screeds of letters to Professor Thomson about those Rings (*Saturn*), and lo ! he was a-laying of the telephone which was to go to America, and bringing his obtrusive science to bear upon the engineers, so that they broke the cable with not following (it appears) his advice."

Maxwell then proceeds to give the words of a " common song " which he " conceived on the railway to Glasgow." This is entitled " The Song of the Atlantic Telegraph Co.," and to avoid repetitions the formula U = (" under the sea ") is used, so that 2(U), by parity of reasoning, represents two repetitions of that sentiment. The first two verses read as under :

2(U)
Mark how the telegraph motions to me,

2(U)
Signals are coming along,
With a wag, wag, wag ;
The telegraph needle is vibrating free,
And every vibration is telling to me
How they drag, drag, drag,
The telegraph cable along.

2(U)
No little signals are coming to me,

2(U)
Something has surely gone wrong,
And it's broke, broke, broke ;
What is the cause of it does not transpire,
But something has broken the telegraph wire
With a stroke, stroke, stroke,
Or else they've been pulling too strong.

. . . . .

" Little," adds Mr. Gibson, " did Clerk Maxwell think that his own scientific work was one day to lead men on to the invention of wireless telegraphy. It was Clerk Maxwell who first predicted the existence of electro-magnetic waves, such as we use to carry our wireless messages through space."

A word must be spared for mention of the chapter devoted to Faraday's life and his connection with applied electricity. It is a model of clear and unostentatious writing, and gives an interesting account of the great general interest which he obtained for electricity, not only by his inventions, but in a large measure also to his charming courtliness and really wonderful tact. A proof of Faraday's popularity is his frequent mention in *Punch*, and among the illustrations of the book is the accompanying cartoon, which we reproduce by kind permission of the publishers. When Faraday was sailing down the Thames he was so impressed with the pollution of the river that he wrote a letter to the *Times* deploring the condition of things. *Punch* followed this with the cartoon shown on preceding page.

## Wireless Amateurs in America.

AN operator contributes to the American MARCONIGRAPH a humorous description of the nuisance afforded by irresponsible wireless amateurs—" We're not trying to knock kids who are in earnest, but we're tired of listening to their love songs in springtime. It is an odd fact that no sooner does a kid get a wireless plant than he gets a girl who has a wireless plant. Or else his chum gets a girl—and that girl always wants to talk over the currents—and there isn't a girl living that can talk for three consecutive seconds about anything but a man.

" The other night we were expecting an order to whoop it out of here on the hunt of a derelict. Washington told us that one had been sighted down about Hampton Roads—in that dangerous angle of which Cape Hatteras is the peak—and the moment that she could be definitely located we were to be off. We had steam up in our boilers, and at a minute's notice we would have yanked the hook out of the mud. And then, as I sat there with my ears growing fast inside the receiver, the kids began to coo. I'd hear a little, faint click. ' Is that you, Sallie ? ' some kid would ask. And Sallie would say, ' Yes, darling,' while every wireless operator between Point-o'-Woods and Portland light howled to her to go kiss a pig.

" And that pair of drooling infants kept up that annoying blither until everybody suddenly went mad. The men on the incoming steamers and the Fire Island station and the station at Sagaponack, and on the cutters and on the steamers in port, began to ' jam ' those messages of endearment. For a solid hour they kept up, until the youngsters finally saw that they would not be permitted to utilise the air for their dribbling folly. And in the meantime the business of all this end of the water world was held up because Sallie loved her Joe."

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## Personal

Vice-Admiral SIR HENRY BRADWARDINE JACKSON, who has been appointed first chief of the Admiralty War Staff, is an officer of high scientific attainments who for the past two years has commanded the Naval War College at Portsmouth. Sir Henry Jackson is a well-known torpedo expert, and has commanded both the Portsmouth and Devonport torpedo schools. His interest in wireless telegraphy is well known, and he was elected F.R.S. in recognition of his researches in electrical physics. He has been Assistant Director of Torpedoes, and from March, 1905, to October, 1908, was Third Sea Lord and Controller.

Congratulations to MR. GEORGE S. DE SOUSA, the traffic manager of the Marconi Wireless Telegraph Co., Ltd., of America, on his approaching marriage to Miss Weymann. The ceremony will take place in New York on February 10th. Mr. De Sousa joined the company about ten years ago as assistant traffic manager, and was later promoted to the important position which he now so capably fills. He controls and supervises the telegraph staff on ship and at shore stations, deals

*Mr. George S. De Sousa.*

with reports from operators and with all correspondence relating to the telegraph business; prepares and issues all forms and circulars relating to the conduct of the ship and shore stations, prepares and issues sailing lists and charts, obtains and issues call letters for all ship and shore stations. Mr. De Sousa's department is also responsible for the training and engagement of operators.

We regret to report an accident to MR. R. BICKERDIKE, one of the directors of the Marconi Wireless Telegraph Company of Canada. Mr. Bickerdike was on his way to the House of Parliament in Ottawa when he had the misfortune to slip on the icy pavement, and fell heavily, breaking his kneecap. Mr. Bickerdike is not at an age when such an accident can be borne with ease, and it is feared that he will be confined to his house for some considerable time.

## Football

The Marconi Club (London) have played the following matches during the last month: On January 11th a League match with Aster resulted in a notable victory for the Marconi Club, who won by 8 goals to nil. The winners showed capital form under very trying weather conditions, while their opponents put up a very stubborn defence. A second League match was played against All Saints, when again the Marconi team won by 4 goals to 2. On this occasion it was the excellent play of the forwards rather than a favouring fortune which decided the contest. Two friendly matches were also played—one against Treloar's, on December 28th, when the Marconis won by 5 goals to 1, and one against Talbot II., when again they were successful by 4 goals to 1.

## Movements of Engineers

### (London)

P. Boucicault, who has been engaged since May in erecting installations on the Great Lakes, Canada, for the Canadian Marconi Company, has now returned to England, and is at present stationed at Poldhu for experience in high-power station work.

F. E. Burrowes, having completed his foreign service leave, is now at Liverpool assisting Mr. Pereira in ship equipment work.

H. B. T. Childs has returned from Canada, and is now at the London office.

W. B. Cole, who has been to Barrow-in-Furness inspecting the Chinese cruiser "Ying Swei," which is equipped with a 3-kw. Marconi installation, is now back in the drawing office, London.

P. Croker has returned from Carnarvon, Wales, where he has been engaged in preliminary work on the site for the Welsh high-power trans-ocean station, and is now at head office.

E. de Lange has been transferred from the Brussels office of the Belgian Marconi Company, and is now attached to the engineering department of the parent company in London.

G. H. Major and H. F. J. Merton have been temporarily transferred from the London drawing office to Liverpool for practical experience in ship equipment work.

A. T. Pole has been transferred from Clifden high-power station to Poldhu for further experience in high-power work.

R. C. Quick left London on January 22nd for Spezia, Italy, to supervise the work of equipping a Portuguese submarine with a Marconi installation.

H. J. Round left London for the Canadian Marconi Company's Glace Bay high-power station, Canada, on January 4th, for special work in connection with trans-Atlantic communication.

A. G. Savill left London on January 10th for Rio de Janeiro, to superintend the erection of two 25-kw. and two 15-kw. land stations in Brazil, which are being erected for the Brazilian Government by the Marconi Company.

E. J. Watts, who has for several months been occupied in China with special work for the company, is now returning to London.

Engineers engaged in the work of equipping merchant ships with Marconi installations are located as follows:

W. H. Brown and A. Flood-Page, assisted by T. H. White (wireman fitters), Glasgow.

W. F. Fielding and L. G. Jeffery, Liverpool.

G. S. Wood, Hamburg.

K. Tremellen and W. H. Venn, London Office.

N. C. Rackstraw, Hull.

G. J. Boome, assisted by T. Harrisen, D. Hasler, and T. Y. Hayton (wireman fitters), London Docks.

### (Canadian Company)

W. A. Appleton has arrived at Montreal from the Labrador stations.

L. S. Hawkins has been transferred from Tobermory, Ont., to Port Arthur, Ont., to take charge of the alterations and installation of new type of apparatus at the latter station.

E. E. Robinson has left Midland, Ont., for Sarnia, Ont., to take charge of the installation of new apparatus at the latter place.

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## Movements of Operators

F. W. Adams, from the "Megantic" to the "Tunisian."
S. H. Adames, from the "Beacon Grange" to the "Cluny Castle."
L. W. Alford, from the "Montezuma" to the "Trent."
F. Amott, from the "Ivernia" to the "Saldanha."
V. W. Ball, from the "Minnetonka" to the "Arzila."
G. K. Barber, from the "Agadir" to the "Moravian."
B. J. Basson, from the "Gloucester Castle" to the "La Rosarina."
C. H. Bartlett, from the "Kenilworth Castle" to the "Edinburgh Castle."
H. S. Bride, from the "Dover Castle" to the "Namur."
A. F. Bruton, from the "Caronia" to the "Empress of Britain."
A. E. Ballard, from the "Athenia" to the "Caledonia" (anchor).
R. E. Blizzard, from the "Saxonia" to the "Demerara."
C. T. Baldon, from the London School to the "Rohilla."
A. H. Bocking, from the London School to the "Rewa."
F. N. Calver, from the "Mandingo" to the "Saxonia."
W. H. Chick, from the "Garth Castle" to the "Potaro."
H. T. Clarke, from the "Nore" to the "Waimana."
L. B. Cleary, from the "Denis" to the "City of Glasgow."
H. T. Cottam, from the "Goorkha" to the "Dover Castle."
K. S. Cowhey, from the "Elmina" to the "Akabo."
W. Crabb, from the "Tainui" to the "Minneapolis."
A. Crofts, from the "Vestris" to the "City of Durham."
C. H. Crossman, from the "Orita" to the "Antony."
D. R. Cormack, from the "Cameronia" to the "Scandinavian."
H. E. Cutbush, from the "Caledonia" to the "Numidian."
F. Campbell, from the "Minneapolis" to the "Royal Edward."
G. M. Coates, from the "Montfort" to the "Inkosi."
C. S. Coulson, from the "Devonian" to the "Cedric."
F. Clark, from the Liverpool School to the "Laurentic."
E. C. Cousins, from the London School to the "Montreal."
N. S. Clarke, from the Italian Company to the "Gascon."
E. W. Dexter, from the "Braemar Castle" to the "Agadir."
R. Dawson, from the Liverpool School to the "Celtic."
R. Ferguson, from the "Ambrose" to the "City of York."
H. A. Flick, from the "Lusitania" to the "Arankola."
P. Foran, from the "Antony" to the "Tropic."
W. G. Fox, from the "Aguila" to the "Suevic."
G. C. Fenton, from the "Simla" to the "Cassandra."
J. C. Farmery, from the London School to the "Magdalena."
F. J. Fookes, from the London School to the "Araguaya."
C. C. Goulding, from the "Salsette" to the "China."
F. N. Gowlett, from the "Grantully Castle" to the "Minnehaha."
F. T. Gardiner, from the London School to the "Californian."
W. F. Gray, from the London School to the "Dongola."
H. P. Hart, from the "Potaro" to the "Montfort."
H. Haynes, from the "Sardinian" to the "Scandinavian."
S. C. Howes, from the "Munster" to the "Flamenco."
H. P. Hunt, from the "Guelph" to the "Arawa."
W. E. Hutchinson, from the "Mount Temple" to the "Edavana."
W. C. Henderson, from the "Lusitania" to the "Ivernia."
C. Harris, from the "Minnehaha" to the "Ascania."
T. H. Hallsall, from the London School to the "Lake Michigan."
E. A. Hickman, from the London School to the "Nyanza."
E. L. Henri, from the London School to the "Arzila."
A. Kingsbury, from the "Suevic" to the "Cufic."
R. Leith, from the "Lusitania" to the "Caronia."
F. J. Linnell, from the Mantaro to the "Oropesa."
R. A. Lovibond, from the London School to the "Highland Piper."
J. MacLeod, from the "Trent" to the "Gaika."
S. E. MacLeod, from the "Athenia" to the "Caledonia."
P. B. Maltby, from the "Empress of Britain" to the "Carmania."
J. E. Marriott, from the "Wakool" to the "Carisbrook Castle."
C. T. Massey, from the "Minneapolis" to the "Kia Ora."
C. V. Maudsley, from the "Caledonia" to the "Karina."
J. M. McKenna, from the "Pretorian" to the "Sardinian."
F. Milford, from the "Virginian" to the "Tunisian."
H. P. Murphy, from the "Flamenco" to the "Victorian."
T. W. Murray, from the "Worcestershire" to the "Nigeria."
M. Monsey, from the "Ortega" to the "Aguila."
H. Melling, from the London School to the "Ausonia."
L. S. Newns, from the Liverpool School to the "Devonian."
R. H. Nash, from the Liverpool School to the "Cornishman."
W. C. Obey, from the "Carpathia" to the "Abosso."
P. O'Keefe, from the "Baltic" to the "Canada."
J. E. Osborne, from the "Lake Erie" to the "Montrose."
T. O'Riordan, from the London School to the "Potaro."
R. H. Packer, from the "Simla" to the "Minnetonka."
C. T. Parker, from the "Kia Ora" to the "Norseman."
G. F. Pepper, from the "Caledonia" to the "Numidian."
C. Peters, from the "Oropesa" to the "Mantaro."
T. G. Peterson, from the "Aragon" to the "Moldavia."
W. Pettingell, from the "Medina" to the "Neuralia."
A. Pink, from the "Uranium" to the "Ortega."
G. Plummer, from the "Gaika" to the "Roya Edward."
A. G. Powell, from the "Narragansett" to the "Lake Erie."
T. W. Page, from the "Highland Scot" to the "Uranium."
J. H. Payne, from the London School to the "Montezuma."
E. P. Parker, from the London School to the "Minneapolis."
D. Robertson, from the "Campanello" to the "Ballarat."
F. W. Rivitt, from the "Columbia" to the "Sardinian."
F. V. Robinson, from the Liverpool School to the "Bohemian."

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THE MARCONIGRAPH

Vol. II.—No. 24. March, 1913. Subscription, 3/6 per annum, post free. Price 2d. Post Free 3½d.

# "Ocean Letters"—Marconi Innovation

THE "Ocean Letter" which comes into being to-day (March 1st) is the latest addition to our many forms of correspondence. It is a wireless message which reaches its destination by registered post.

The combination has been designed by the Marconi International Marine Communication Company to meet the demand of many travellers who desire to transmit inexpensive messages when they are beyond the range of direct communication with land stations. By this innovation it is now possible to send a wireless message from one ship to another ship going in an opposite direction for delivery by registered post from the first port of call of the latter vessel. Where registration cannot be effected the "Ocean Letter" will be forwarded by ordinary letter post.

The cost of such messages, which will only be transmitted when both vessels are beyond the range of communication with a shore station, is 5s. 6d. for the first thirty words, including postage and registration fee, and one penny per word thereafter up to a maximum of 100 words, international counting.

The messages can only be transmitted between ship and ship, and between ships going in opposite directions. The sender of an "Ocean Letter" is not free to choose a ship to which the message shall be sent. Its disposal will depend entirely on local conditions.

"Ocean Letters" will rank in priority after fully paid and franked messages, and will only be dispatched after radiotelegrams accepted under the provisions of the International Convention, and after ordinary traffic. Special forms and envelopes for this new class of traffic have been issued.

Until further notice "Ocean Letters" will only be transmitted to ship stations controlled by the undermentioned, and under no conditions whatever will they be sent to a coast station for delivery by post:

The Marconi International Marine Communication Co., Ltd., Marconi House, Strand, London, W.C.

La Compagnie Française Maritime et Coloniale de Télégraphie sans Fil, 35 Boulevard des Capucines, Paris.

La Compagnie de Télégraphie sans Fil, Rue Brederode, No. 13, Brussels.

The Marconi Wireless Telegraph Company of Canada, Ltd., 86 Notre Dame Street, Montreal.

The Marconi Wireless Telegraph Company of America, Lords Court Building, 27 William Street, New York.

Marquis L. Solari, Via del Collegio Romano, No. 15, Rome.

The new service is already assured an extensive popularity with travellers, particularly commercial travellers and other business men, and when the facilities it affords are better appreciated the service will undoubtedly command an extremely large circle of users. Nearly two weeks in some cases will be saved by those who use "Ocean Letters" as a means of communication. A business man leaving Southampton for New York on a Saturday will probably find his vessel out of range of coast wireless stations on the following Tuesday. Should he then desire to communicate with a friend in England he would have in the ordinary way to wait until he reached New York to post his letter. By means of the "Ocean Letter" he can now at very slight expense have a letter transmitted to a vessel approaching Queenstown which will be put in the registered post on arrival in that port and delivered in London or Edinburgh next morning.



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M. A. MUSNIER

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# M. Alfred Musnier

## Administrator of La Compagnie Française Maritime et Coloniale de Télégraphie Sans Fil

M. MUSNIER has surely no need of a formal introduction to our readers, for since the early days of wireless telegraphy he has been intimately connected with the development of this wonderful invention, and has contributed to the formation of La Compagnie Française Maritime et Coloniale de Télégraphie Sans Fil, of which he is one of the administrators.

Born in Paris in 1846, M. Musnier, after completing the usual college curriculum, applied himself vigorously to the study of the law. His terms completed, he immediately entered business and took up work with two companies in which, by reason of family ties, he already had a strong personal interest. These were La Société des Messageries Nationales (whose foundation dates from the latter part of the eighteenth century) and La Compagnie des Messageries Maritimes.

From the outset M. Musnier spared no pains to acquire a complete knowledge of the business, even to its smallest details. His was not the hasty career of the novice with friends at court, who makes a meteor flight through the various departments of a business house and ultimately finds himself in a position of trust for which he is ill-equipped and, worse still, ill-adapted. Slowly but surely, and with infinite thoroughness, he passed from grade to grade of the business ladder, so that when in 1876 he became manager of the Les Messageries Nationales he was possessed of two qualifications which everywhere ensure success—an intimate interest in and a personal knowledge of the work he was directing. Later, in 1901, M. Musnier was appointed President of Les Messageries Nationales.

But while M. Musnier has spent so largely of his time and energy for the benefit of these two great institutions, his activity has still found opportunity to interest him in other business enterprises. Setting aside his connection with La Compagnie Française Maritime et Coloniale de Télégraphie Sans Fil, he is not the least important member on the board of many companies and associations founded to meet the public needs—amongst which are La Société Commerciale de Port Saint Louis du Rhone, an Italian mining society. He is president of a large maritime insurance company—La Compagnie Centrale, and a director of one of the largest shipbuilding companies in France—La Société des Forges et Chantiers de la Mediterranée, which possessed at La Sayne et le Havre two of the largest ship-yards in France. It was founded about the same time as La Compagnie des Messageries Maritimes, and is therefore long since past its jubilee, and looking forward to the celebration of a centenary.

Furthermore, M. Musnier is a member of the French Maritime League, and of the Society of Commercial Geography, as well as of the French Association of International Maritime Law. But, leaving his connection with the world of affairs, let us turn for a moment to the study of the man himself, or rather, as space is limited, let us briefly sketch his characteristics, and then, after recording a significant episode in his private life, leave the reader to draw his own conclusions. He is a large-hearted and generous-natured man, always ready to help a lame dog over a style, and never concerning himself with the personal cost that his generosity may entail. He is shrewd and he is painstaking, and these two qualities conjoined with benevolence make M. Musnier a man worth knowing, and a friend worth keeping. Not a few have realised this fact, and amongst these are his old schoolmates. About twelve years ago he was asked by the unanimous vote of Rollin College, his beloved *alma mater*, to become president of their Old Boys' Association.

A strong sense of good fellowship and a considerable amount of tact are required if such a position is to be successfully filled; but M. Musnier's comrades are disposed to congratulate themselves on their choice, and their satisfaction is demonstrated by the fact that M. Musnier still presides at their friendly gatherings.

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# The Resistance of Radiotelegraphic Antennas*

By Dr. L. W. Austin

IT has been known to many experimenters that the antenna resistance was much larger at longer wave-lengths than should have been the case according to the Hertzian theory of radiation. Dr. C. Fischer has carried out some interesting experimental observations, showing that this increase in antenna resistance is, under certain circumstances, proportional to the wave-length, and he appears to believe that this increased resistance is due to radiation.

Systematic measurements on the resistance

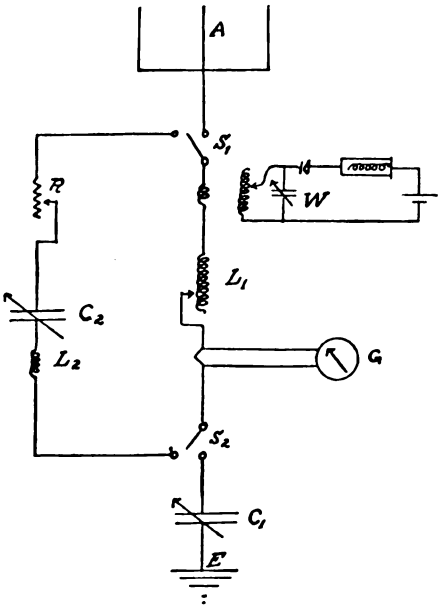


*Fig. 1. Diagram of Apparatus for measuring Antenna Resistance*

of the Bureau of Standards antenna have been carried out, and observations have been taken on the antenna of the U.S.S. "Dolphin," lying at the Washington Navy Yard, and on the antenna of the Navy Yard station.

The arrangement of apparatus is shown in Fig. 1. Here A is the antenna, E the ground, $L_1$ the tuning inductance, $C_1$ an air condenser for tuning to very short wave-lengths, Th a thermo-element, G a galvanometer, and $C_2$ a variable air condenser set at the capacity of the antenna to be measured. A small inductance, $L_2$, was sometimes inserted in circuit with the condenser, $C_2$, to represent the antenna inductance. This has little influence on the results, and, at least, for the longer wave-lengths may be omitted. $S_1$ and $S_2$ are switches for connecting either the antenna and ground or $C_2$ to the rest of the circuit. R is a resistance introduced in the circuit, $C_2$, to bring down the thermo-element deflection to the same value as that observed when the antenna and ground are in circuit. The high-frequency resistance consists of separate units of fine constantin wire inserted in mercury cups. The measurement circuit is excited by a buzzer-driven wave-meter, W, of the ordinary type.

Fig. 2 shows the curves obtained on the "Dolphin" at the Washington Navy Yard and at the Bureau of Standards. It is seen that, beginning with the short wave-lengths, the resistance falls rapidly in accordance with the Hertzian radiation theory, until a point is reached which is not far from twice the fundamental wave-length of the antennas.

Curve A is the Bureau of Standards, B the U.S.S. "Dolphin," and C the Washington Navy Yard. In curves B and C the resistance rises gradually, as observed by Fischer, but the rise is much slower than in his curves. The height of the flat-top antenna of the "Dolphin" is approximately 90 ft. above the water, while that of the Washington Navy Yard is 150 ft. The Navy Yard has practically a water ground, the station being but a few feet from the river, which is moderately salt at this point. The fundamental of the "Dolphin's" antenna is 315 meters, and its capacity is 0.0073 microfarad. The fundamental of the Navy Yard antenna is about 1,000 meters, and the capacity is 0.0036. The radiation resistance for these two antennas calculated according to the equation

$$R_r = 1600\ h^2/\lambda^2$$

is shown in the dotted curves, B', C'. It is seen that the observed curves for the shorter wave-lengths follow with a considerable degree of approximation the curvature of the calculated radiation resistances, although the observed curves lie somewhat higher, while beyond the minimum the two curves lie far apart. We have here an indication of two factors in the resistance—one decreasing as the square of the wave-length, while the other increases nearly directly as the wave-length.

* Abstracted from the Journal of the Washington Academy of Sciences.

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It seems probable that the portion of the resistance which increases as the wave-length is ground resistance, or more properly earth current resistance.

The resistance of the Bureau of Standards antenna is shown in curve A. This antenna is a 8-wire harp, 180 ft. high at top, and 60 ft. high at bottom. This makes the centre of capacity 120 ft. from the earth. The natural period is 425 meters, and the capacity 0.0012 microfarad. The ground wires are connected to the water pipes of the laboratory. It is seen that the minimum ground resistance is much higher than in the case of the " Dolphin " and Navy Yard, and that the straight portion of the curve slopes more steeply upward than was the case in the other two antennas measured. It has been observed that the steepness of this portion of the curve, as well as the resistance at the minimum, differs by a very appreciable amount from day to day according to the dryness of the soil. On the day following a heavy rain the minimum frequently falls by two or three ohms; at the same time the resistance at a wave-length of 3,000 meters sometimes falls as much as ten ohms. The resistances are usually slightly higher in the afternoon than in the morning.

It is a matter of interest to know toward what point the straight portion of the resistance curve descends. According to Fischer it would cross the zero axis near the fundamental, and in the curve of the Washington Navy Yard this also appears to be the case. At the Bureau of Standards, the curve of which has been taken much more accurately than any of our other observations, it appears to point toward the zero of co-ordinates. This may, however, be due to the presence of an initial ohmic resistance of about 5.5 ohms in the pipes of the ground connection.

TABLE OF RESISTANCES FOR ANTENNA.

| λ | G. | Rr. | Rr+G. | Observed. |
|---|---|---|---|---|
| Meters. | Ohms. | Ohms. | Ohms. | Ohms. |
| 400 | 5·5 | 13·4 | 18·9 | 22·5 |
| 600 | 8·0 | 5·9 | 13·9 | 15·0 |
| 800 | 11·0 | 3·4 | 14·4 | 13·6 |
| 1,000 | 13·5 | 2·1 | 15·6 | 15·2 |
| 1,200 | 16·5 | 1·5 | 18·0 | 17·3 |
| 1,500 | 21·0 | 0·95 | 22·0 | 21·0 |
| 2,000 | 28·0 | 0·54 | 28·5 | 27·7 |
| 2,500 | 34·5 | 0·34 | 34·8 | 34·5 |

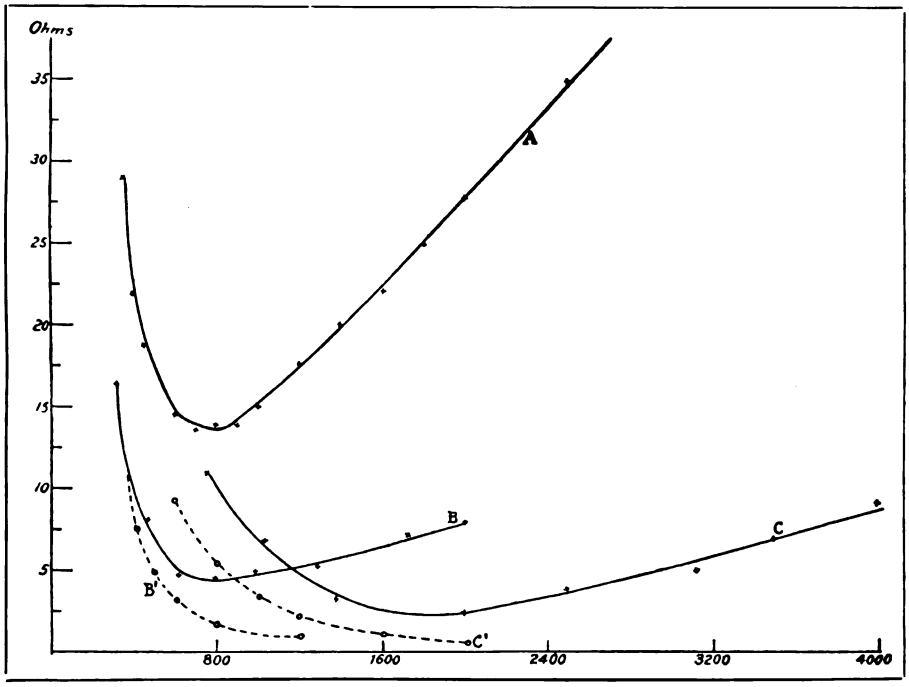


*Fig 2. Diagram Showing Resistance Curves*

In the table under G is given the ground resistance, taken from a prolongation of the straight portion of curve A. Under $R_r$ is given the calculated radiation resistance, from the Ruedenberg formula, while in the last two columns are given the sum of these resistances and the observed values of the curve.

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## Technical Notes

A MAGNETIC SENDER.—From small equipments, such as may be used in outlying stations and by explorers, etc., where accumulators cannot be conveniently charged and maintained, quite good wireless signals can be emitted by aid of a simple magnetic tapper. As early as 1855 Ruhmkorff observed that, under certain conditions, the sparks obtained from the secondary circuit of his induction apparatus were longer and more intense when the primary circuit was broken by hand than when a high-speed hammer break was employed. This phenomenon was attributable partly to incomplete saturation of the magnet core in the latter case (owing to the short current duration), and partly to the effect of "extra current" on closing the primary circuit. These facts are applied in the following apparatus:

The core of a Ruhmkorff apparatus, without primary winding, is excited by a bundle of high-class permanent magnets (weighing a few pounds). To obtain a long spark from a light apparatus, the reversal of flux in the core must be as rapid as possible, the magnetising period must be as long as possible, and the air-gap in the magnet circuit must be reduced to a minimum. A convenient arrangement is to place a number of highly saturated U magnets of decreasing perimeter parallel to each other and so as to form opposite poles in two straight somewhat divergent extensions. The ends of the magnets terminate in soft-iron blocks. This arrangement permits the core of the induction apparatus to lie between the two poles, and the core is provided at its ends with two pairs of iron arms, of which one surrounds the two poles at the end where the latter lie closer together, and the other lies between the poles at the other end. This arrangement enables the magnetic circuit to be completed through the core, and practically the whole of the flux can be made to traverse the latter if care be taken that the movable arms make good contact with the magnet extensions. The displacement of the magnet core and arms, to reverse the direction of flux through the core, requires a certain expenditure of energy, but can easily be effected by hand.—*L'Elettricista.*

* * *

BEHAVIOUR OF METALS UNDER THE OSCILLATORY DISCHARGE FROM A CONDENSER.—A paper on this subject, read at a recent meeting of the Royal Society by Prof. E. W. Marchant, is published in the *Electrician*. The method adopted in the investigation was to photograph by a revolving mirror the spark caused by the discharge. In order to check the accuracy of measurement, spark photographs were taken of the discharge from an air condenser through an air-core inductance. The agreement between calculated and observed frequencies was within 1 per cent. With a glass condenser the capacity measured by the frequency of the discharge through an air-core self-induction was less than that obtained by ballistic measurements. When the discharge from these condensers was passed round a coil having a core of fine iron wires, the discharge consisted of a series of oscillations, the time for each oscillation increasing as the discharge died away. The discharge was much more quickly damped when the iron wire core was inserted. From these results a curve was drawn giving the relation between magnetising force and "effective permeability." This curve was employed to determine approximately the resistance of the spark. The method was adopted as follows:

For any given discharge the current passing during the first half oscillation was estimated; from the "effective permeability" for the second half oscillation, the magnetising force corresponding to it was found from the curve, and hence the current passing. Hence the loss in energy during the first half oscillation was estimated. The losses of energy consist of: (1) Ohmic loss in the resistance of the wires; (2) eddy current hysteresis loss in the iron core; (3) losses due to the resistance of the spark, and possibly due to dielectric hysteresis. The spark resistance increased with decreasing current through the spark. The values of the magnetising force used varied from 500 to 5,000 gauss, and of current in the spark from 100 to 1,000 ampères. The permeability of iron when subjected to the magnetising force due to an oscillating discharge was not sensibly different from that found by ballistic tests. The frequencies employed in these experiments varied from 10,000 to 100,000 cycles per second. With cores made of thicker iron wire it was found that the "effective permeability" was not very different from that obtained with very fine wires. The damping of the discharge was more rapid with the thicker iron wire cores. With cores of solid iron the discharge was reduced to one-half oscillation. With cores of solid brass or copper the damping was less rapid than with the cores of iron. Nickel wire cores produced similar effects to those observed with iron, but of diminished intensity. Some experiments were made in which the coils were wound round a brass tube about 0·5 mm. thick. This tube completely screened off the effect of the iron wire core when it was inserted. Cores made with fine insulated copper wire produced no effect either on the damping or frequency of the discharge.

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## Wireless Relieves Channel Islands

### Emergency Station for Fort George.

THE heavy weather experienced at the beginning of February broke the cable between England and the Channel Islands, and created a situation which threatened the utmost inconvenience to business men at both ends of the wire. It occurred at a time when considerable business transactions between growers and salesmen were in course of negotiation. It was impossible to communicate between England and Guernsey except viâ Sark, which put the growers in the awkward position of having, in addition to suffering additional delay, to pay 2d. a word in place of the normal inland rate of ½d.

Wireless telegraphy saved the situation. The Post Office hurried operators out to Fort George to open up communication, and for three days, during February 2nd, 3rd, and 4th, after the station was fitted up, the whole of the telegraphic business was conducted by wireless between the Islands and the Marconi wireless station at Bolthead, on the south coast. From Fort George the messages were delivered throughout Guernsey by the Post Office.

An average of six hundred messages were passed per day, in addition to the usual Press work. No hitch whatever occurred in transmission.

Residents of the Island, especially the commercial business men, greatly appreciated the service, and the Press commented in glowing terms upon it. So impressed was the Post Office by the satisfactory solution of what threatened to be a situation that would have entailed very serious loss to a large number of business firms in the Island, and by the necessity of preventing a repetition of it, that it will shortly erect at Fort George a wireless station which will be available for regular communication with Bolthead whenever the cable business is threatened with interruption.

## Iceberg Patrol for the North Atlantic.

CO-OPERATION between the Board of Trade and the principal Atlantic steamship lines for the purpose of carrying out the recommendation of the Merchant Shipping Advisory Committee as to stationing an ice observation vessel in the North Atlantic will result in a vessel being located off the east coast of North America during the coming spring, to watch the break-up of the ice and to report its movement on the way to the routes.

The vessel chosen for the service is the "Scotia," a whaler, formerly employed on the Scottish Antarctic expedition.

The "Scotia" has been fitted with a 1½-kw. Marconi wireless installation, having a range which will permit her easily to keep in touch with the wireless stations in Newfoundland and Labrador. Three scientific observers will be stationed on board, who will make use of the occasions on which the vessel is stationary to carry out oceanographical and meteorological observations concerning currents which will not only be of general scientific interest, but of direct value to the work in hand. The White Star Line has acted on behalf of the North Atlantic shipping companies, who will share the cost of the "Scotia's" upkeep with the Government. The "Scotia" has been thoroughly overhauled in dry dock at Dundee, and is expected to leave on her mission early in March.

General satisfaction will be felt not only by navigators, but by the travelling public, that something has at last been done by the Government to co-operate with the United States in its humanitarian work.

The United States Government is notably to the front in this work of "policing" the ocean: its activities extending not merely to notifying mariners of dangerous ice, but to warning them against the equally menacing floating derelicts, of which more threaten navigation in the North Atlantic than on any other route. Last year the United States sent a special cruiser to patrol the ice region, but it has long had patrolling its own seaboard derelict destroyers designed specially for the work. There is at the moment a Special Derelicts Committee sitting in this country with a view to formulating some method of dealing with these floating perils, the danger of which is enormously minimised by the services of wireless telegraphy.

## Berne Bureau.

The following countries have agreed to contribute to the funds of the International Bureau (Berne) for the purpose of wireless service: German East Africa (4th Class), Bosnia-Herzgovina (5th Class), Spanish Colony of the Gulf of Guinea (6th Class), U.S.A. (1st Class), German Protectorate of the Pacific (4th Class), Siam (4th Class), Togo, Cameroons and German S.W. Africa (4th Class).

According to *The Broad Arrow*, wireless telegraph operators in the employ of the General Post Office are not to be allowed to join the Territorial Force without the previous sanction of the Postmaster-General.

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# The International Radiotelegraphic Convention

## Ratification by the United States Government

## Report of the Delegates

THE International Radiotelegraphic Convention, signed by delegates representing the various countries in London on July 5th, 1912, comes into force in July of the present year. But before it can take effect it must receive the approval of the various Governments whose representatives appended their signatures to the Convention.

The United States Government have given a lead in the matter, for on January 23rd the Senate passed a resolution advising and consenting to the International Radiotelegraphic Convention with the final Protocol and Service Regulations. The following proviso was added :

> That the Senate advise and consent to the ratification of said Convention with the understanding to be expressed as a part of the instrument of ratification that nothing in the Ninth Article of the Regulations affixed to the Convention shall be deemed to exclude the United States from the execution of her inspection laws upon vessels entering in or clearing from her ports.

The following message to the Senate was received from President Taft dated January 8th, 1913 :

> I transmit herewith, with a view to receiving the advice and consent of the Senate to its ratification, an authenticated copy of the Radiotelegraphic Convention, signed at London on July 5th, 1912, with the Final Protocol and Service Regulations connected therewith.
>
> I also transmit, for the information of the Senate in its consideration of these instruments, a report by the Secretary of State, with accompanying papers.

The Secretary for War wrote as follows :

> I have the honour to acknowledge the receipt of the copy furnished by the British Government of the International Radiotelegraphic Convention, concluded at London on July 5th, 1912, together with the Final Protocol and the Service Regulations. I beg to advise you that the War Department is in thorough accord with all the provisions contained therein, and that there is no reason why the Convention should not now be submitted to the Senate to receive the advice and consent of that body to its ratification.

Mr. Benjamin S. Cable, the acting Secretary of the Department of Commerce and Labour, submitted the following observations upon the report of the American delegates :

> I have the honour to acknowledge the receipt of your letter of the 7th instant, enclosing a copy, furnished by the British Government, of the International Radiotelegraphic Convention concluded at London on July 5th, 1912, with the Final Protocol and Service Regulations.
>
> Complying with your request that I advise you whether this department sees any reason why the Convention should not now be submitted to the Senate for the advice and consent of that body to its ratification, I have the honour to state :
>
> In submitting the Convention, Protocol and Regulations, the attention of the Senate should be called to the Service Regulations, Article IX., paragraph 2, which reads :
>
> > 2. Every ship station holding a licence issued by one of the contracting Governments must be regarded by the other Governments as having an installation fulfilling the conditions imposed by the present regulations.
> >
> > The competent authorities of the countries where the ship calls may demand the production of the licence. In default of such production, these authorities may ascertain whether the radiotelegraph installations of the ship satisfy the conditions imposed by the present regulations.
> >
> > When an administration has practical evidence that a ship station is not fulfilling these conditions, it must in every case address a complaint to the Administration of the country to which the ship is subject. From that point onwards the procedure shall be, when necessary, as provided in Article XII., paragraph 2.
>
> In legislation concerning safety of life at sea which it may be feasible to complete during the current session of Congress, it will be desirable, in my opinion, to follow the general principle that where the laws and regulations of a foreign country are as effective as the laws and regulations of the United States for the same purpose, such foreign laws and regulations should be recognised, subject always to the reservation

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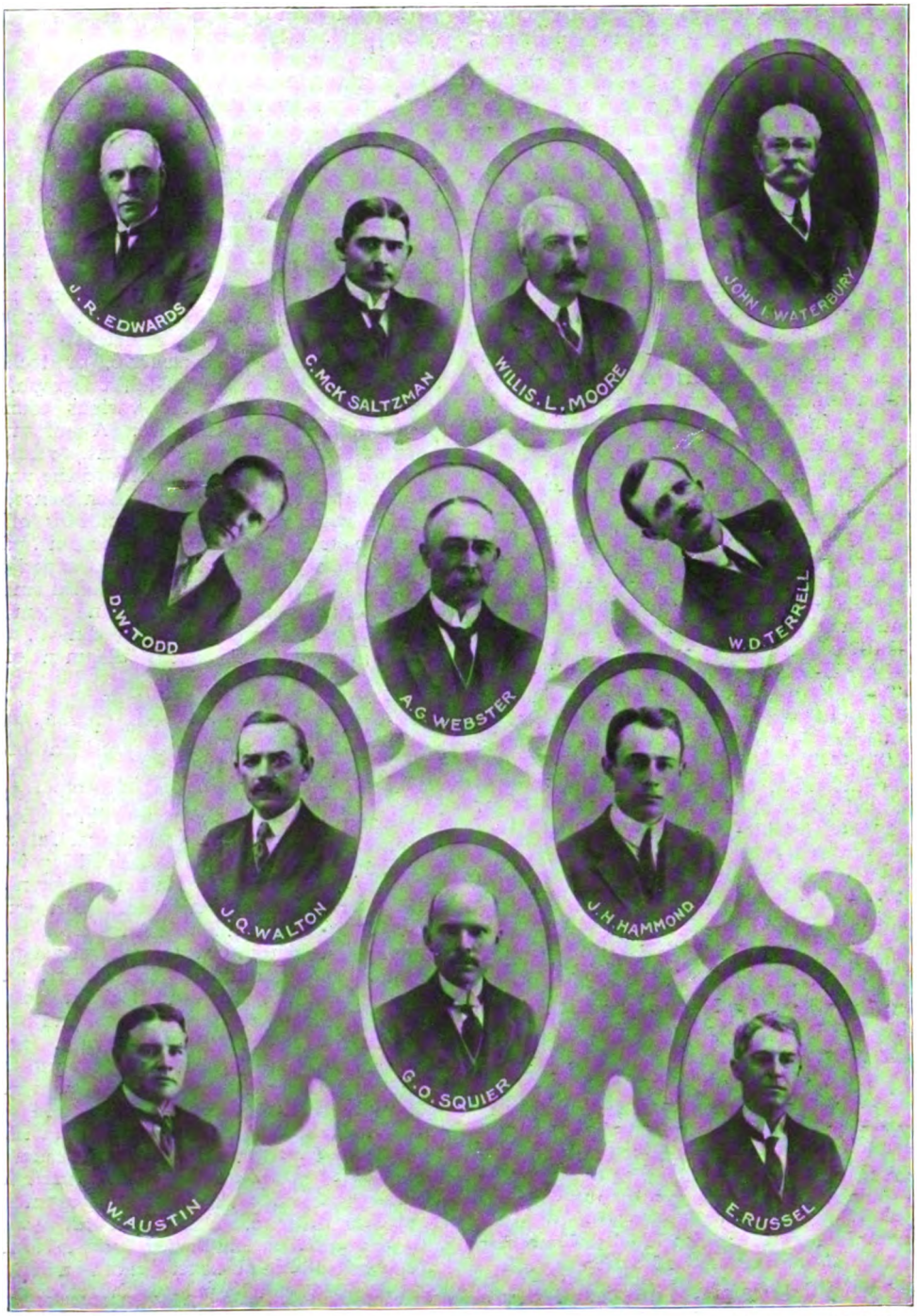


*Photos by*] [*Dover St. Studios*

THE UNITED STATES DELEGATES.

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that our officers shall have the right by actual examination to assure themselves that such laws and regulations are, in fact, complied with.

This principle is disputed in the paragraph of the article just quoted, which would deny to our officers the opportunity by actual examination to assure themselves that the apparatus on a foreign ship in fact conforms, when the ship is about to depart from an American port, with requirements of the foreign licence which may have been issued long before. The ratification of this paragraph without amendment might seriously impair the legislation by Congress upon this subject during the past two years.

While the paragraph refers only to compliance with regulations included with the Convention, these regulations, it will be observed, in important respects are identical with or similar to provisions of the Acts of July 23rd, 1912, and August 13th, 1912. Our right to inspect under those Acts might be disputed on the ground that the subject matter for inspection on foreign ships was provided pursuant to the Convention, which permits inspection only if a licence cannot be produced. The paragraph quoted is not found in the Berlin Convention, and the difficulties it offers may readily be overcome by changing in two places the word "doit" to "peut" ("must" to "may"), and by striking out the words "A default de cette production" ("In default of such production").

The attention of the Senate should also be called to so much of Article XI. as provides that auxiliary apparatus "must be able to work for six hours at least, and must have a minimum range of 80 nautical miles in the case of ships of the first class and of 50 miles in the case of those of the second class." The Act of July 23rd, 1912, provides that the auxiliary power supply must enable the sending set "for at least four hours to send messages over a distance of at least 100 miles day or night." The provision for auxiliary apparatus agreed upon at London was before the Conference Committee of the Senate and the House at the time the provisions of the Act of July 23rd were under consideration, and this department believes that Act in this respect is preferable to the portion of Article XI. mentioned.

I shall be pleased to be advised when the Convention with the Protocol and Regulations is submitted to the Senate.

The representatives of the United States at the London Conference were:

Prof. A. G. Webster.
Rear-Admiral John R. Edwards.
Prof. W. L. Moore.
Captain John Q. Walton.
Major G. O. Squier.
Major Edgar Russel.
Captain C. McR. Saltzman.
Lieut. Commander David W. Todd.
Dr. L. W. Austin.
Mr. John I. Waterbury.
J. Hays Hammond, jun.
Mr. W. D. Terrell.

The report deals exhaustively with the subjects discussed at the Conference, and, in the opinion of the United States representatives, the *personnel* of the London Conference might be regarded as constituting a strong assembly. About 40 per cent. of the delegates present were administrative, executive, or technical officials acting for the postal, telegraph, and cable departments of the various countries represented at the Conference. About another third of the assembly (37 per cent.) were composed of army and navy officers of the various countries represented at the Conference, the relative ratio of naval and military officers being about 4 to 3. About 6 per cent. of the delegates were trained and experienced diplomats, and the remainder included eminent scientists, noted meteorologists, and prominent personages interested in the technical, commercial, and humanitarian development of the art.

**Sir Henry Babington Smith**

The United States delegates in their report pay a fitting tribute to the president of the Conference. They state that:

"The Conference was exceedingly fortunate in having for its presiding officer a singularly accomplished and tactful man, one who headed the British delegates at both the Berlin and London Conferences—Sir Henry Babington Smith. An experienced diplomat and able linguist, a parliamentarian of high order, a recognised postal and financial administration expert, and a man of culture, tact, and decision, he commanded the admiration, respect, and esteem of every delegate to the Conference. It was due to the policy, tact, and wise judgment of its presiding officer that there was maintained a conciliatory sentiment and spirit which enabled the Conference to conservatively and yet in its variance discuss and dispose of every proposal that had a tendency to arouse antagonism and resentment of a bitter nature. The extent and character of the work accomplished by the London Conference is the best encomium and highest tribute that can be paid to the value of the services rendered by its esteemed and able presiding officer."

In reviewing the work of the Conference it

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is pointed out in the report that, as regards the settlement of purely technical matters, the American delegation took a prominent part. The work of the Berlin Conference was of an exceptionally progressive and meritorious nature, and it had anticipated advance along the line of radiotelegraphy to such an extent that the Convention of 1906 did not admit of any radical amendments or additions.

**Scope of the Amendments**

In all, about 350 amendments, additions, and proposals were considered in some form by the Conference. About 100 of these proposals were accepted in full or in part, the majority of the amendments adopted, however, being of a minor nature. The important changes effected were of the following general nature :

Commercial, humanitarian, meteorological, technical, and military and naval.

Under the first heading every maritime country was requested to establish certain coast stations whose equipment and permanent service would be of such capacity and character as to meet the following requirements :

(*a*) An installation of appliances that would not only enable the station to hear all calls of distress from ships near by or approaching the coast, but which would also be able to expeditiously and effectively handle necessary or emergency commercial work.

(*b*) Technical complement and installations that would possess continuous facilities for forwarding at regular periods will be demanded on certain classes of ships.

Priority of transmission of weather messages was secured by a proposition which regarded meteorological radiograms as of an important official character. The American delegates reported that if the regulations will be consistently complied with, such a system of reports and forecasts can be acquired as will reduce the loss of life and property on the Atlantic Ocean to a very material extent.

With the successful development of the project of the Atlantic Ocean it is intended to extend the service to all seas and oceans. For example, through co-operation between European Governments the Mediterranean may by this method be charted every morning, and forecasts made accordingly. The utility of this service will be particularly apparent when one contemplates that, with the opening of the Panama Canal, there will be a great increase of shipping in the waters adjacent to the steamer centres of the Gulf of Mexico, Caribbean Sea, and certain ports of the Atlantic and Pacific Oceans.

In the technical section it is pointed out that it was finally agreed that long range ship to shore communication should be transmitted provided that a wave-length of 1,800 metres be used ; that the ship should communicate only in this way to shore stations of its own country ; and with the further restriction that such communication should not take place when a ship was within 25 miles of any coast station.

**Naval and Military Services**

With the exception of the United States delegation, substantially every maritime Power represented at the Conference refused to consent to a proposition made for extending the range of wave-lengths for commercial and maritime purposes, due to the probability that such action might lessen the efficiency and reliability of the military and naval stations; particularly in England and Germany is the fact recognised that even now radio apparatus is an important weapon of war, and that international safety may be involved in the delay in developing and extending radiotelegraphy concomitary with the advance made by rival Powers.

The United States delegates were strikingly impressed by the zeal, economy, and efficiency by which the Berne International Bureau has been conducted, and they report that, in view of the important and valuable service rendered by the officials of the Bureau, their emoluments and remunerations are not proportionate to the work performed.

There is a reference in the report to the chain of wireless stations which the British Government have in contemplation. It is pointed out that Germany and France are also contemplating the establishment of chains of high-power radio stations which are deemed absolutely essential for the development of their colonial trade and shipping, as well as for augmenting the efficiency of the fleet and the increased protection of their colonies.

The report concludes with a recommendation that the various executive departments of the Government directly interested in various phases of radiotelegraphy should urge the Congress to make such liberal provisions as regards extension and development of this means of communication as would not only meet the early future requirements of the departments concerned, but likewise the military and commercial demands of the nation.

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Mrs. F. B. Chambers, of Philadelphia, recently obtained a wireless operator's licence at the examinations in that city, and, it is said, she showed greater proficiency than most of the male applicants.

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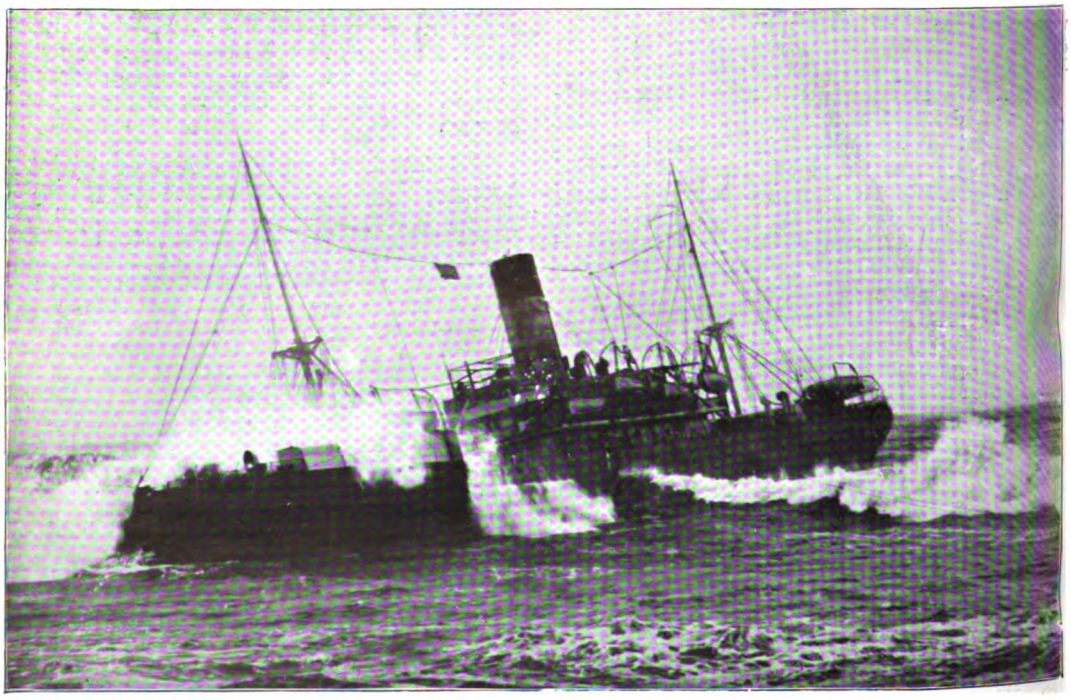
# The Tragedy of Shipwreck

SHIPWRECK stories appear to us, who read of them seated in our easy chairs with our toes toasting at the fireside, to be so very similar one to another, that the account of another vessel wrecked arouses little more than a passing interest. Now, it is obviously true that, as far as the general outline of the event is concerned, the same procedure takes place on all occasions of shipwreck. A vessel is in danger, appeal for help is signalled, immediately other ships make every effort to assist her, and the work of rescue is successful or otherwise as the case may be. But in detail there is quite sufficient variety of incident; in fact, rather more than suffices for the average mortal. For think what shipwreck means to the passenger aboard! Why, to him it is an earthquake in the midst of the sea, when his whole world is turned upside down and the very bulwarks of his existence are washed away.

It may, therefore, be interesting to our readers if we reconstruct the story of the wreck of the "Veronese" from information supplied by an eye-witness who has communicated a number of incidents which have escaped the notice of the daily Press.

The vessel left Liverpool for Vigo on January 11th, and there took on board some 300 Portuguese passengers, mostly emigrants. She weighed anchor on January 15th, outward bound for South America.

But she was destined to complete but little of her proposed voyage, for the following day, at 5.30 a.m., she struck the Boa Nova Rocks, about half a mile outside Leixoes Harbour.



*The "Veronese" on the rocks, showing the aerial cut through to secure life line.*

The first intimation of the disaster was a series of four jerks which were felt throughout the whole of the vessel, and it was fortunate that the impact was of sufficient force to send her well on to the sunken ledge of these sharp and precipitous rocks. As she lay in this perilous situation she leaned heavily to starboard, so that this part of the vessel was

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*An Isolated Chapel.*

completely awash. Immediately on the first intimation of the disaster, Mr. Smith—the Marconi operator in charge—sent out the signal of distress, "S.O.S.," and quickly received a reply from the Dutch vessel "Hollandia," which straightway came to the aid of the wrecked vessel, and stood by her throughout this trying period. It was fortunate that she did so, for immediately after the collision the ship's dynamos were swamped, so that all lights went out, and the ordinary 1½-kw. wireless set was rendered practically useless. The operator, however, immediately changed over to the emergency set, which every Marconi installation carries, and this was in excellent working condition, so that he had no difficulty in communicating with the "Hollandia," which in turn sent messages to the marine station at Vigo. By this time all the passengers on the "Veronese" were aroused, and intense excitement prevailed. But the captain was prepared for such an emergency, and under the trying circumstances he acted with a promptitude and decision which were worthy of the best traditions of seamanship. The crew, which numbered about ninety, were called to keep order, and as soon as the "Hollandia" signalled that she was coming to their aid, he announced the fact to the passengers and so prevented anything approaching a panic. Furthermore, he gave orders that all the women and children should be placed in lifeboats, and this accordingly was done, though the boats themselves were not launched, as they would never have lived in the heavy sea that was running. Only in one instance was this privilege abused, when one man was discovered dressed up in feminine apparel in order that he might be amongst the first to leave the ship. But when his craven attempt at self-rescue came to light, he was placed under strict observation, and was not allowed to leave the vessel until everyone else of the passengers had been saved.

As might have been expected at so early an hour in the morning, the disaster found the passengers in but scanty attire, and for many there was no opportunity of securing garments, as the inrush of water made entry to the cabins impossible. But all available wardrobes were ransacked and every dry garment utilised, the officers themselves contributing their own kit to the common stock. The motley result of such promiscuous attire can be better imagined than described, and would, but for the seriousness of the situation, have been provocative of mirth. But all this time the sea was doing its best to wreck the vessel, and huge waves were washing the decks, while one monster



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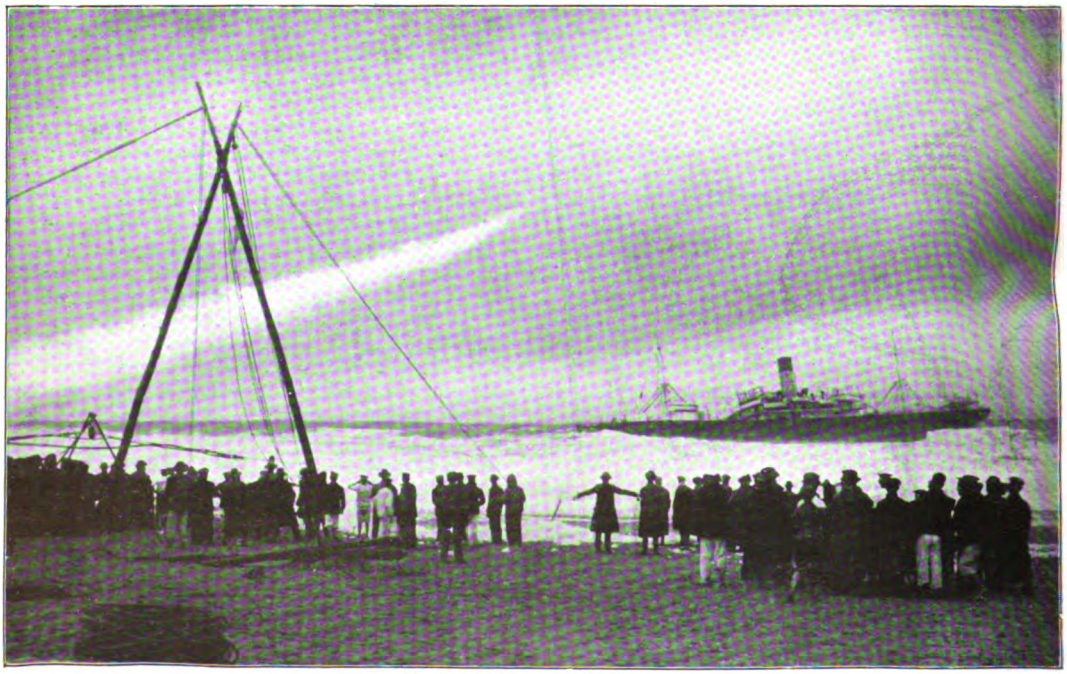
wave, invading the music room, wrenched its iron door from the hinges, and in titanic sport lodged it in the crow's nest. On another occasion a piano on the boat deck, which was securely packed and strapped to the deck, was completely wrecked, and afterwards its parts were discovered lying on the rocks more than half a mile away. By this time the authorities at Leixoes Harbour had installed their life-saving apparatus on the most likely position on the shore for reaching the distressed vessel, and at this point the " Veronese " was certainly not more than 350 yards away. Even then it was difficult to reach the vessel, and forty-eight rockets were fired before a rope could be secured on the " Veronese," for in many instances the rockets went wide of the mark ; others again fell too short of the vessel, while others, in the course of their passage, burnt the rope to which they were attached, so that it fell adrift and was useless. The successful shot lodged the rope over the wireless aerial, and this had to be cut away before the hawsers could be secured to the mast. Even then the difficulties were not over, for the tempestuous sea greatly added to the strain placed upon the line during the working of the breeches-buoy ; the rope—and it was some 3 inches thick—more than once snapped like cotton, and the work of communication had to be commenced all over again. As it was, throughout the Thursday, only thirty lives were saved. But after this a fresh contingent of helpers joined forces with the rescue party, and the work of life-saving progressed more rapidly. These helpers were English officers, who were in charge of some Norwegian ships stationed in the River Douro, and their business-like methods acted as a gentle stimulus to the other rescuers, with the result that on the Friday night some eighty lives were saved.

But all this time the lot of the passengers was hardly one to be envied. Food was very scarce indeed ; in fact, it was not until the breeches-buoy was in working order that anything could be procured at all, and then the only provisions which were sent from the shore by means of the buoy were eggs and bottles of water. When, on the Saturday, the sea calmed considerably, some of the crew were able to reach the refrigerators, and oranges and milk were procured.

The journey from ship to shore in the breeches-buoy was perilous in the extreme. On one or two occasions the rope by which it was suspended snapped, and the unfortunate occupant was thrown into a sea wherein nothing could live. On another occasion, during the manipulation of the ropes, the buoy, when half-way across, turned turtle, and again the occupant—this time a stewardess on the " Veronese "—was drowned.



*Rocket fired from the shore.*

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Rescue by the buoy was, however, the means of bringing a curious fraud to light. One woman absolutely refused to divest herself of some over-voluminous garments which hindered the adjustment of the apparatus, and it was only by a herculean effort that she was squeezed into the ample girth of the belt. Finally she reached land, and equal force had to be used to haul her out of the buoy. Of course, in her transit she had been soaked to the skin by the waves, but she vehemently refused to have any of her garments removed; so when all peaceful persuasion failed, pressure had to be brought to bear on the refractory individual, and her clothes taken away by force. Then the reasons for her resistance were apparent. Bundles of the ship's spoons and forks were found completely encircling her waist.

By Saturday, however, the worst of the danger was over. From the turn of the tide the storm gradually subsided, and lifeboats were enabled to approach the wreck and take off the remaining passengers and crew. All the survivors were well looked after in Leixoes, the English by the English colony there, and the Portuguese by their own compatriots. The Portuguese Government offered to convey home those of the passengers who were anxious to return, while the company to which the "Veronese" belonged offered to find places on other of their vessels for those who still desired to make the journey to America. Both offers found ready acceptance, but still a fair percentage of the passengers could not be accounted for, and have not been to this day. They did not accept either of the proposals, they certainly were not drowned, and as far as evidences were concerned, they vanished into thin air. The reason for this peculiar conduct was afterwards explained. When examination of the ship's cargo was made for purposes of salvage, it was discovered that about 300 revolvers had been boarded by some of the emigrants. Apparently they had formed a gun-running combine on a small scale, and correctly surmising that after the shipwreck their dealings in contraband would come to light, they had thought it advisable to make themselves scarce as soon as possible.

In the course of a communication, Captain Chas. Turner, who was in command of the ill-fated vessel, paid the following generous tribute to the work of the wireless operator. He said:

> "I beg to call your attention to the splendid conduct of Mr. L. Smith, Marconi operator, on the occasion of the wreck of the s.s. 'Veronese,' January 16th last, on the Portuguese coast. He stayed at his instrument from the beginning, until it was put out of action by the water pouring in on it. During this time the breakers were pounding the vessel and sweeping over fore and aft. After the machine was out of action, he reported the fact to me and calmly helped in the work outside. At nights he took turns with the third officer signalling by Morse lamp to the shore (British seamen from vessels in Oporto were there by this time). In fact, the signalling was constant, as each person was saved by the breeches buoy. Nothing could be finer than the way he stayed at his post, constantly drenched by rain and seas. I may mention that 243 persons were on board, and towards the last I stated I would be the last to leave, the third officer next ahead of me, and that I would like 'Marconi' to go ahead of him. His answer, 'Right, sir,' exemplifies the man. The period of life-saving was from 5.30 a.m. January 16th to 2.30 p.m. 18th. Afterwards in fine weather in reboarding he gave me most intelligent and hearty assistance."

The public service of the wireless stations at Castiadas (Cagliari, Sardinia) and Sfer Racavallo (Palermo, Sicily) has been temporarily suspended owing to damage occasioned to the apparatus.

The New York Electrical Society has published in pamphlet form the lecture of Commendatore G. Marconi delivered before that body in New York on April 17th, 1912. Several illustrations are included in the text. Mr. G. H. Guy, 29 West 39th Street, New York, is secretary of the society.

At the annual meeting of the British North Borneo Company, the chairman announced that the company were entering into a contract for the erection of three wireless stations—at Sandakan, Selimpopon (the headquarters of the coal-mining industry), and Jesselton—and the question of a fourth station at Lahad Datu in Darvel Bay was also being considered. One of the principal objects of the board's policy of development was to make Jesselton the chief port of call in the China Sea, and they were pushing ahead with a system of lighting those parts of the coast which at present were a danger to shipping. In connection with this matter they hoped to secure the assistance of the Government of the Philippines.

The *Bulletin de l'Union Panaméricaine* reports that a Bill has been submitted to the Congress of Peru concerning the opening of a credit of £17,750 for the installation of two wireless telegraph stations: the one at the north coast, and the other at the south coast of the country.

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# Progress Abroad

*(Specially Contributed)*

### Australia

SYDNEY, *January 4th.*

The station at Brisbane (call letter P O B) has been opened for public service, the rate for messages being 6d. per word without minimum. The Port Moresby (Papua) and Mount Gambier (South Australia) have also been opened for public service. Mount Gambier is situated in the vicinity of Cape Northumberland, close to the Victorian border.

It is proposed to erect a station at Gabo Island on the New South Wales coast, 242 miles south-west of Sydney.

### Brazil

RIO DE JANEIRO, *January 10th*, 1913.

The coast station at Cabo St. Thomé was inaugurated last week and opened for public traffic.

It is proposed to erect a station at St. Luiz de Maranhao, probably a 5-kw. Marconi. The Telegraph Department have been granted a credit of £6,000 to build a station at Porto Murtinho.

The following are the wireless stations now in working order in Brazil:

Fernando Noronha, 35-kw.; range, 1,800 metres. Olinda, 5-kw. Amaralina, 5-kw. Sao Thomé, 26-kw. Mont Serrat. Florianopolis. Junçao, 5-kw. Lagoa. Senna Madureira, range, 2,800 and 1,800. Rio Branco, range, 1,800. Cruzeiro do Sul. Babylonia, range, 300. Manaos and Porto Velho.

A new wireless district has been created by Law No. 2,738 of January 4th, 1913, with a credit of 732 contos, to include the Acre, Amazonas and Para wireless stations, and after these stations have been taken over by the telegraph department they will be opened to public traffic.

Law No. 2,719 of December 31st, 1912, fixes the wireless rates at 6 francs for a telegram up to 10 words, and 60 centimes for each word extra; included in the rate is the transmission between a coast station and the telegraph stations to which the wireless station is directly joined up.

There is also a tax of 25 centimes a word for every State the telegram passes through. The ship tax, as fixed by the Telegraph Department, is 240 reis a word, and the coast station and forwarding charge is 360 reis, equalling together one franc; 10 words are charged for, and the extra tax of 25 centimes is collected when necessary.

### Canada

MONTREAL, *January 31st.*

The work in connection with the duplexing of the Transatlantic service has been finished as far as the Canadian side is concerned. Messrs. Round & Robb reached Glace Bay from England about the middle of January to attend to the final adjustment of the receiving apparatus for the duplex work. High-speed transmitting apparatus has also been successfully installed at Glace Bay.

The equipment of the station at Sarnia, Ont., for the Canadian Government is now well under way, and is expected to be completed about the end of February.

In connection with the closing of some of the Gulf of St. Lawrence stations, great difficulty was experienced last fall in relieving the operators owing to exceedingly stormy weather.

Engineer J. O. G. Cann is still at Battle Harbour. An attempt was made by the steamer "Portia," of the fleet of Bowring Brothers, Newfoundland, to reach Battle Harbour about the middle of January, but this steamer was unable to penetrate the heavy slob ice in the Straits of Belle Isle. Another trial will be made the next time the steamer "Portia" goes north, and it is hoped that she will be successful in getting Mr. Cann away.

Operator Cashell was unable to leave Point Amour station, and must remain there until the early spring unless he is able to obtain a passage by one of the sealing steamers which may reach Point Amour during the latter part of March.

The operators on the Heath Point station have been unable to leave. Several attempts have been made by the Canadian Government steamer "Montcalm" to take them away, but the stormy weather in the Gulf of St. Lawrence during the month of January rendered all efforts fruitless.

This extraordinarily stormy weather has been felt all over the North Atlantic Ocean. It appears to have shown itself in the Gulf of St. Lawrence in a winter so far exceptionally free from cold usually obtaining at this time of the year. The river St. Lawrence is still running freely wherever the current is at all rapid, and it would be quite possible to-day for a steamer to reach the city of Montreal. Owing to the unusual absence of ice it is expected that the season of navigation for the Gulf of St. Lawrence for the season of 1913 will open up earlier than usual.

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From statements which were widely circulated in the Press during the early days of January, it appears that "extended wireless service" is among the good resolutions of the General Post Office.

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## Notes from the United States.

**Institute of Radio Engineers.**

At the annual meeting of the Institute of Radio Engineers held last month, the following officers were elected to serve for the year 1913: President, G. W. Pickard; vice-president, Mr. R. H. Marriott; secretary, Mr. E. Simon; treasurer, Mr. J. H. Hammond, jun.; managers, Messrs. J. L. Hogan, jun., J. S. Stone, R. A. Weagant, and L. Espenschied. At a meeting of the Board of Managers shortly after, Dr. A. N. Goldsmith, of the City College of New York, was appointed editor of publications.

**Transpacific Wireless Stations.**

The Marconi Company has commenced the erection of eight wireless telegraph stations, two pairs for Atlantic service, and two pairs for Pacific service. Receiving and sending stations thirty miles apart will be constructed at Oahu, in the Sandwich Islands; Tamales Bay and Bolinas, Cal.; near Belmar, N.J., and in eastern Massachusetts at a point not yet definitely selected. These stations will be part of a globe-girdling system which will continue to the east by way of Japan, and thence ultimately to India. Twelve towers ranging in height from 400 feet to 450 feet will be spread out over a semi-circle covering a square mile at each station, and it is estimated that the range of each station will be from 4,000 to 6,000 miles.

**Honouring Wireless Heroes.**

The movement on foot in the United States to honour the memory of wireless operators who died in the performance of their duties during shipwreck has been advanced a stage further. Recently Park Commissioner Stover met at Battery Park Mr. H. B. Walker, president of the Old Dominion Steamship Company, Mr. H. H. Raymond, vice-president of the Clyde line, and Mr. C. C. Galbraith, of the Marconi Wireless Telegraph Company of America (who is chairman of the Phillips Memorial Fund in the United States), and selected a site for the fountain for Jack Phillips, George Sczpanck, and George C. Eccles, wireless operators who have gone down with their ships.

A prominent corner in the Children's playground at Battery Park was chosen. Commissioner Stover is fully in accord with the proposed memorial, and not only offered the most favourable position in Battery Park, but will plant two trees to shade the fountain.

**The Marconi Organisation.**

The Marconi Wireless Telegraph Company of America is an important and ever-growing organisation. It controls practically the whole of the wireless affairs of the United States, and is the fountain-head of a communication service which is indispensable to the administration of State affairs, and has its ramification in every variety of private enterprise. The central offices are situated in one of the principal thoroughfares of this vast metropolis of the New World.

The leading spirit in this great house of business is Mr. John Bottomley, whose biography appeared in the December number of THE MARCONIGRAPH. He it is who has organised and is responsible for the up-to-date methods in all its departments, and the fact that this immense organisation runs as easily as a well-oiled machine is sufficient testimony to the efficacy of his control.

His right-hand man is Mr. George S. de Sousa, who holds the responsible position of Traffic Manager. Many are the important branches of service which come under his supervision. He arranges for the maintenance of a continuous message service, sees that due observance is taken of the general regulations of the company, controls the telegraph staff on ship and shore stations, deals with reports from operators and the heavy correspondence connected with the general telegraph business. To him falls the task of issuing the sailing lists showing the approximate time at which steamers may be expected to be in communication with the coast stations, and which are supplied to all telegraph offices throughout the country so that radio messages destined for ships at sea can be properly routed. In close touch with the Traffic Department is the Contract Department, which transacts all business connected with the sale and rental of wireless apparatus, and negotiates all contracts for wireless installations on ship and shore.

Another important branch of the organisation is the Engineering Department. It is under the guidance of Mr. Frederick Sammis, who supervises all work of constructing apparatus, and to whom all design sheets for new or improved machinery are brought for approval. The responsibility of such a position can hardly be exaggerated, and the fact that at the present time the Engineering Department is refitting and retuning some 650 ships and shore stations, and has just delivered a large number of sets to the United States Army and Navy Departments, while a 100-h.p. station for the United Fruit Company at Santa Marta, Columbia, has recently been successfully completed, another of the same type at New Orleans is about half-finished, and work has been commenced on a third at Swan Island, is sufficient proof of the immense amount of work that is here brought to a successful issue.

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# The Training of Operators in New York and Madrid

FOR no other hobby but wireless telegraphy surely can it be claimed that so many of its devotees have ultimately made it the business of their life ; from a fascinating experiment it has become the chosen career of many hundreds of young men.

The reason is not far to seek. The operating side of wireless telegraphy offers nearly all those attractions for which a youth looks in a profession on which he contemplates embarking. The pay and prospects are good, there is no wearying "apprenticeship," the hours as a rule regular, the work interesting, and the life at sea an attractive and varied one.

The honorary rank of a junior officer is usually that of a wireless operator on board ship. He signs the ship's articles as a member of the crew, and is subject to the disciplinary regulations of the ship. On a passenger vessel his life usually runs on pleasant lines. On ships carrying two operators a continuous watch is maintained, but where one operator is the rule the hours of duty are sometimes long and irregular. In port, however, there is very little for the wireless man to do, and splendid opportunities are presented for seeing foreign countries which, in the old days, would have meant for a young man an arduous voyage "before the mast."

*A Class Room at the Marconi School, New York.*

The scale of pay is slightly higher than that paid to telegraphists in the home Government and cable services, and much higher than that received by railway telegraphists, and is increased more rapidly. Good quarters, food and attendance are provided in addition, and, except in very special circumstances, the

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operator is called upon to do nothing but attend to his wireless work. After a term at sea the operator may qualify for a shore appointment or for a travelling inspectorship, with special pay; if he fits himself for it he may be transferred to the engineering staff of the company. But, apart from these opportunities, valuable appointments become vacant from time to time in many parts of the world on yachts, warships—even airships—and special services on land.

The young man between 21 and 25 who has a pretty sound general education, a knowledge of electricity and magnetism, knows something—even a little—of foreign languages, and has had some previous experience of telegraphic work, has everything in his favour.

To turn him into an efficient operator is one of the special features of the work which the Marconi companies have set themselves in various countries. Coming fairly well prepared to the company a man should, without undue trouble, pass the necessary examinations to obtain an appointment after only six weeks' tuition. Others not so well qualified take longer, but as a rule not more than six months.

Such is the demand for qualified operators that the Marconi companies have been compelled to make special arrangements for training men as wireless operators. Four of their largest schools are in London, Liverpool, Madrid and New York. The Liverpool school, the pioneer of wireless schools, was established in 1903, and is under the charge of Mr. F. E. D. Pereira; the school in Marconi House, London, was opened in September last, and described in our issue of that date; the New York school was also opened in September, and the Madrid school is the latest to be added to the list. The number of students who attend the schools more than justifies their existence.

*Receiving Messages at the New York School.*

No excuse for subsequent lack of proficiency exists in these schools; the apparatus installed is of the most up-to-date pattern, and such as is in actual commercial operation, and every student is thoroughly drilled in its use. The New York school possesses a set such as would be fitted to a large vessel. It consists

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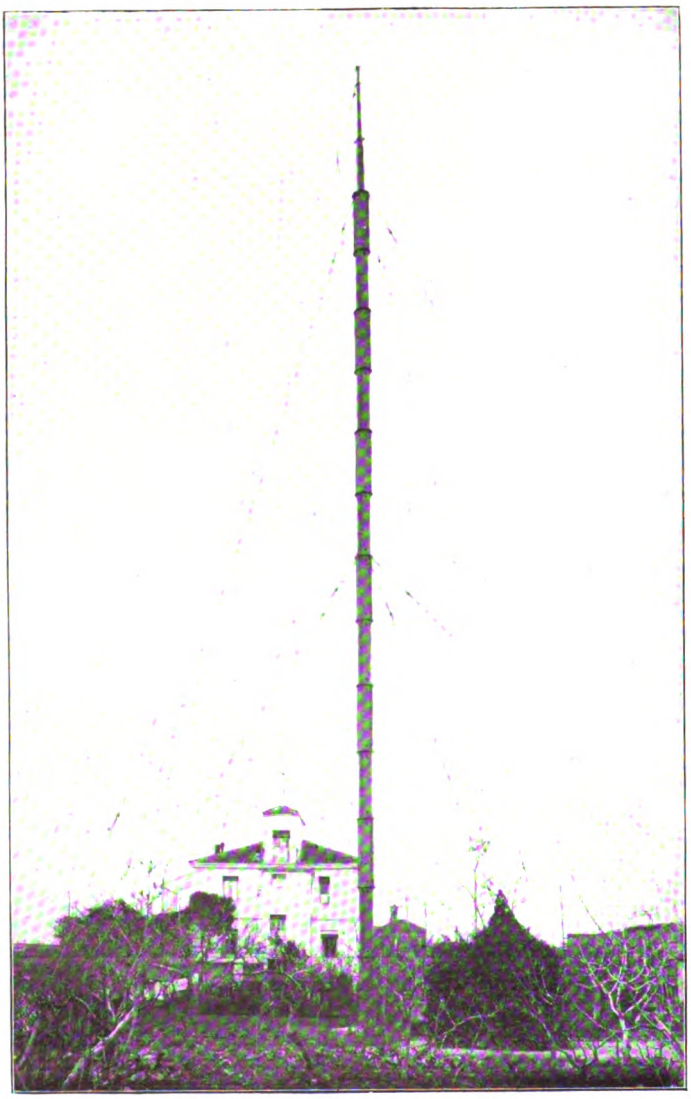
of a 2-kw. 240 cycle-discharger transmitting set with switchboard and controlling appliances, and a 2-kw. quencher spark set, with all the necessary apparatus for adjustment and the obtaining of resonance. There is also a standard auxiliary set with storage cells, and a large amount of apparatus for demonstrating the application of electricity and magnetism to wireless telegraphy. A Fleming cymometer, which enables the operator to ascertain the number of oscillations determining the frequency of the Hertzian waves, is also provided. For daily instruction a standard auxiliary set with storage cells is in use, and amongst a large amount of experimental equipment there are wave meters for measuring wave-lengths andobtaining resonance in transmitting circuits, and a decremeter, an instrument used in measuring the logarithmic decrement of damping. A Wheatstone transmitter in the class room for Continental Code practice enables messages automatically to be sent to the class at any speed desired.

When they attain some little proficiency in their work the American students are allowed to receive actual messages direct from ships at sea, the class-room being fitted with the latest type of receiving apparatus connected to an aerial on the roof of the building.

The Marconi school at Madrid is situated in the Barrio de Tetuan, 5 kilometres from the centre of the city and easy of access by a good service of tramcars. It stands with various minor buildings in extensive grounds, which were acquired by the Compania Nacional de Telegrafia sin Hilos for the purpose.



*View of the Madrid School and Mast.*

The school is directed by Lieut. Don Manuel Moreno Quesada, engineer of the Compania Nacional, and Don Juan Gonzalez Rueda, ex-professor of the naval school. Mr. W. Grey Martin, of the Marconi school at Liverpool, is also an instructor.

The spacious class-room, which is a feature of the school, provides ample accommodation for the students. It is well equipped with apparatus necessary for wireless telegraph work, and it is arranged in such a fashion that students can receive instruction in both sending and receiving wireless signals. Instruction in the various schools is carried out more or less

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on similar lines, and to describe the Madrid school in detail would merely be to go over ground which has already been adequately covered in our description of other schools. The features which distinguish the Madrid school are those calculated to meet the peculiar requirements of Spain. Instruction is given under conditions which make it possible to obtain the highest efficiency. Not only is technical instruction given, but the clerical side is included, and French and English are also subjects taught at the school.

then turns his attention to a course in elementary magnetism and electricity, and on attaining proficiency in this theoretical work he is taught the practical manipulation of the various apparatus in use, how to trace and remove faults, and how to repair break-downs. A thorough instruction in the rules and regulations laid down by the Radiotelegraphic Convention for the commercial working of wireless telegraphy, and a drilling in clerical work connected with telegraphic accounts and returns, brings the course to a close.

*One of the Class-rooms in the Madrid School.*

The library contains an important collection of modern works on wireless telegraphy. Adjoining the main class-room is the 1½-kw. transmitting set, which is constantly in service; the students taking watches of eight hours each, during which they are able to familiarise themselves with the practical work of a wireless station.

On entering one of the Marconi schools a student, if a beginner, is first instructed in the sending and receiving of signals by means of the Morse sounder, buzzer and telephones. He

Thoroughness is the keynote of the Marconi instruction. Both the theory and practice of wireless telegraphy are comprised in the course of daily instruction. As soon as a man succeeds in passing the necessary examinations and can receive and send messages at the rate of 30 words per minute, he immediately joins the operating staff of the Marconi Company and at the first vacancy is drafted for service at sea, and the total fees paid during the period of his instruction are refunded.

There is no disappointment, no weary

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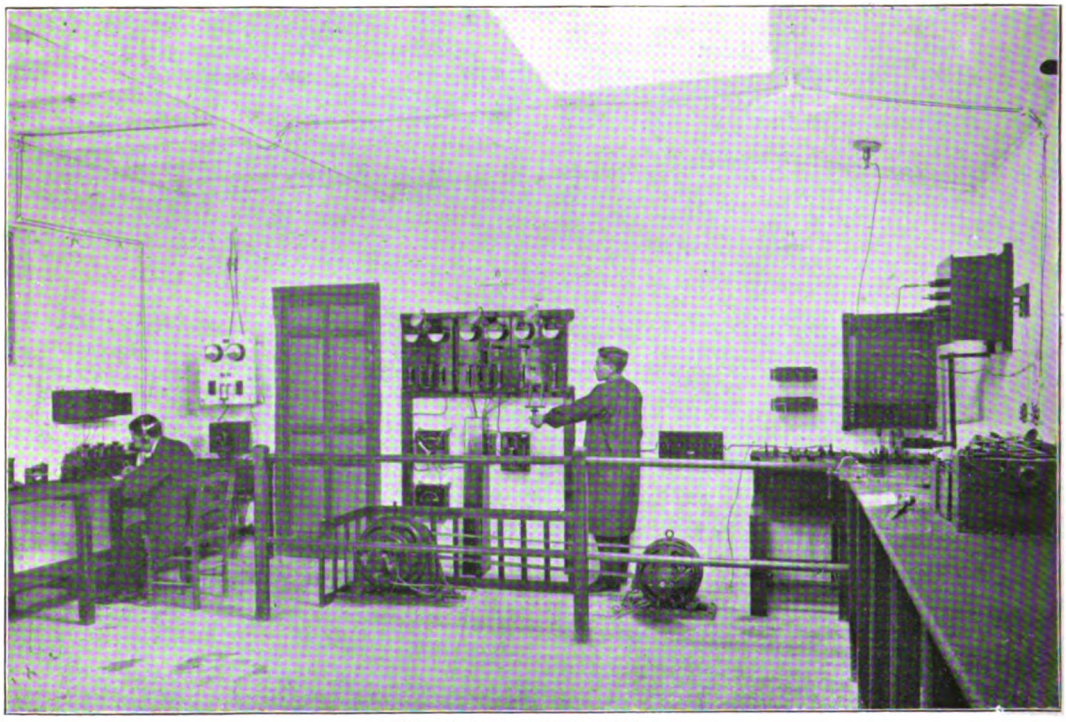

*The Marconi School in Madrid.*

waiting after you have qualified for your job. Of how many openings can it be said that there is a bright future and—after less than a year's training—a position which yields an income sufficient to make a man independent ?

## The Sculptor and the Model.

Prince Paul Troubetskoi has long ago come into the kingdom of his art. Indeed, it is not to be supposed that such vitality as is displayed in his sculpture would long wait for appreciation. His work may lack smoothness, it may be wanting in those little caresses which make the medium "flow," but it has reality. Whatever Troubetskoi purports to portray, that he re-creates whether it be in bronze or marble or precious metal—precious indeed after his hands have welded it—for it is no longer a model, but an individuality instinct with life. One of this artist's latest works is a gold tablet which was presented to Mr. Marconi by prominent members of New York Society on his leaving America earlier this year. It bears the head and shoulders of Mr. Marconi modelled in basso-relievo, and it shows all the marked characteristics of the great sculptor—not excluding his energy and impatience. A reproduction of this tablet appeared in the June MARCONIGRAPH. The methods Troubetskoi employs in working out his effects have given Mr. G. Bernard Shaw an opportunity for including an entirely "Shavian" paragraph in his review of "L'Art," Auguste Rodin's new book, which appears in *The Nation* :

"Troubetskoi once made a most fascinatingly Shavian bust of me. He did it in about five hours, in Sargent's studio. It was a delightful and wonderful performance. He worked convulsively, giving birth to the thing in agonies, hurling lumps of clay about with groans, and making strange, dumb movements with his tongue, like a wordless prophet. He covered himself with plaster. He covered Sargent's carpets and curtains and pictures with plaster. He covered me with plaster. And, finally, he covered the block he was working on with plaster to such purpose that, at the end of the second sitting, lo ! there stood Sargent's studio in ruins, buried like Pompeii under the scoriæ of a volcano, and in the midst of a spirited bust of one of my reputations, a little idealised (quite the gentleman, in fact), but recognisable a mile off as the sardonic author of 'Man and Superman,' with a dash of Offenbach, a touch of Mephistopheles, and a certain aristocratic delicacy and distinction that came from Troubetskoi himself, he being a prince. I should like to have that bust ; but the truth is, my wife cannot stand Offenbach-Mephistopheles."

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## Wireless on the Gold Coast.

WIRELESS telegraphy made its *début* on the Gold Coast on Christmas Eve, when the following messages of congratulation were exchanged between the Governor and Commander-in-Chief, Sir Hugh Clifford, K.C.M.G., and Major Bryan, through the newly-erected Marconi station at Accra:

*GOVERNMENT GAZETTE*

(Extraordinary),

ACCRA, GOLD COAST, WEST AFRICA.

FRIDAY, DECEMBER 27TH, 1912.

*Telegram.*

Sir Hugh Clifford,
s.s. "Falaba."

In this, the first message transmitted by the Accra Marconi station, I tender, on behalf of the Gold Coast Colony, a hearty welcome to Your Excellency and Lady Clifford.

BRYAN.

Major Bryan, C.M.G.,
Accra.

Hearty thanks and Christmas greetings to you and to all my friends, colleagues and associates in Gold Coast Colony, from my wife and myself, and my earnest hope is that we may succeed, by our united efforts, in enhancing the prosperity of the Colony. I fear we shall not reach Accra before 1 p.m. to-morrow.

CLIFFORD.

A notable impulse to the development of the British Colony, it is confidently anticipated, will be given by the establishment of the radiotelegraphic station in the capital. Accra, with a population of 20,000, lies on the seaboard 70 miles from Cape Coast, in a territory which, though notoriously unhealthy in the matter of climate, is exceedingly fertile, particularly near the coast, and abounds in mineral wealth. Gold is plentiful in the districts of Wassau and Tarkwa in the west. The annual export of products is valued in the neighbourhood of £1,000,000, and consists principally of palm oil, rubber, palm kernels, lumber, cocoa, kola nuts and gold dust.

Wood is almost absent in the construction of the Accra station, the excessively damp nature of the climate rendering the sparing use of it advisable. The main mast consists of a sectional steel mast 200 ft. in height situated in the centre of a circle, on the circumference of which are four other tubular steel masts 60 ft. high. The main aerial is of the umbrella type, the second being a twin wire type aerial. The length of the wave normally transmitted will be 300 metres, but the station is capable of transmitting waves varying in length from 600 to 900 metres.

The equipment consists of a 5-kw. set driven by an oil engine. No special features distinguish the power plant. The prime mover is a 5 h.p. oil engine, to which is direct-coupled a 3-kw. continuous current dynamo, having a pressure regulation suitable for enabling it to be used to charge the accumulator battery of 54 cells. The motor alternator consists of a continuous current motor, designed to run off the accumulator battery and to drive a disc discharger mounted on an extension of its shaft. The transformer is designed to afford a transformation ratio of either 300 to 10,000 or 300 to 5,000 as desired.

## A Wireless Lament.

THAT the Admiralty just now is engaged in a series of long-distance experiments, to which the southward voyage of the Dominion battleship "New Zealand" lends itself, is the belief of the London correspondent of the *Yorkshire Observer*, who seems to have a hobby in wireless telegraphy.

Dramatic, indeed, was the message sent out from the Admiralty on the evening of February 17th and passed from Portsmouth to Gibraltar for transmission to the "New Zealand," then well on her way down the West Coast of Africa.

"It came to me," states the correspondent, "as it must have come to every naval wireless operator within a thousand miles of Portsmouth. This was the message:

'They sleep in peace amid the eternal snows,
Their goal achieved, their duty nobly done.
And over these whose victor's crown is won,
The loud shrill requiem of the tempest blows.'

"No words are needed," continues the correspondent, "to suggest the thrill with which suddenly out of the void a remarkable message of this kind materialises to the ear. It is almost as though the universe itself were brooding over the dead."

"Messages," he concludes, "are being sent out every two or three hours—mostly in code, but some, as in this, in plain language. The majority of them have been of the commonplace kind usual in such tests, but for once at least the operator, or whoever may have been responsible for the message, was stirred by something little short of inspiration."

The "message" is the first of the stanzas of a tribute to Captain Scott and his comrades, headed "England's Debt," which appeared in the *Daily Mail* of February 12th over the signature "Touchstone."

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## The Influence of Wireless Telegraphy upon National Defence.

THE report of the Director-General of Ports and Telegraphs of the Republic of Columbia contains a summary of a letter addressed to one of the leading newspapers in the country advocating the establishment of wireless telegraph stations. The Director-General also emphasises the necessity for establishing stations on the frontier as an aid to national defence, and he recalls the Bill submitted before Congress in 1911. The purport of this Bill was to authorise the Executive to erect wireless stations in the districts in the east and south of the Republic, and at other places where it should be thought necessary, by means of a credit of $200,000 for the cost of the installation. The Bill was well received in the Senate, where it was amended by raising the sum to $300,000, and also put forward for approval at the first discussion, but there was not time to deal with it afterwards.

Whilst the Bill was under discussion it was thought opportune to accept former estimates which the Government received for stations at Santa Marta and Cartagena.

### The Plan Outlined.

In the course of his letter to *El Tiempo*, Mr. G. Perez deals with the radio-telegraphic service as an element of national defence, as well as of colonisation and exploitation of extensive and wealthy districts.

"If in the report," he adds, "I expressed my opinion regarding the establishment of this modern system in Columbia to-day as a luxury, it was because the scheme submitted for my consideration dealt with wireless stations in Bogotá, Medellín, and Cartagena, where the existing telegraphic system would have to be maintained, and, at the same time, the outlay for the installation and maintenance of the wireless system would be incurred. To-day the outlook has changed. There are vast regions to explore in the extreme east and south of the country; we have to colonise and cultivate various places from Arauca down to Caquetá.

"The Government opens roads in the south of the ancient Tolima and through Pasto; from Pore and from Salina de Chita one goes slowly and with difficulty to Arauco, on our frontier with Venezuela; through San Martín travel with great sacrifice brave explorers in search of rubber and other products of the wild regions of the rivers Vaupés and Guayebero.

"But who hears from these travellers, unless after long and weary intervals? When will the intrepid pioneer who penetrates into these forests receive news from his friends concerning the government of his country, the state of political feeling, the course of business, the fluctuations of trade and commerce? Silence accompanies him in his struggles against hostile Nature, and courage and hope alone sustain him until he returns from his banishment, if he ever returns.

"Such conditions as these must not be allowed to remain indefinitely. It is necessary and extremely urgent to facilitate rapid communication between all the towns of the Republic and other principal centres of the wild portions of Columbia.

"Arauco, San Martin, Puerto Arturo (at the junction of the Ariare and the Guayabero), Calamar (upon the River Unilla), Tresesquinas (where the Ortequasa drains into the Caquetá), and Puerto Córdoba and La Pedrera (where the Caquetá receives the tributary Apoporis) should receive telegrams in a few minutes, as any other Columbian office.

### Opening up the Forest.

"Our army in the middle of the forests, even in the neighbourhood of the Amazon, over by the Putumayo, should be capable of transmitting news and detailed information regarding its position in less than an hour to the Minister of War at Bogotá, and the latter should be able to give the army precise instructions a few minutes later.

"The opportunity to acquire this great advantage to-day is exceptional. A wireless mast erected upon the Cordillera Oriental, in Andalucía, would control all as far as the Amazon plain, and would be the axle of the radio-telegraphic service. The distance to the Customs port of Arauco is 140 leguas; to San Martín, 50; to Puerto Arturo, 72; to Calamar, 63; to Tresesquinas, 35; and to Puerto Córdoba, 148.

"The greatest distance from the central to another corresponding station, as that of La Pedrera, is 148 leguas. The Andalucía station, the only one situated at an altitude (it is 2,760 metres above sea-level, and has an average temperature of 13° centigrade), would directly control all the others in the scheme, and would become the central station between any two of the others. Moreover, it would also be the base for the future installation of other stations in various parts of the Republic and on the Atlantic and Pacific coasts.

"The army will soon possess its portable wireless apparatus; two military bodies will be able to communicate by its means over a distance exceeding 15 leguas. The Minister of War, sitting in his office, would then be able to communicate with all sections of the army through the Andalucía station."

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## Monthly Miscellany

WIRELESS telegraphy will be a feature for the equipment of the "Fram," Captain Roald Amundsen's vessel to be used in his expedition to the North Pole, which is due to start in May. Captain Amundsen also intends to carry a wireless equipment on the sledges in his final dash to the Pole. It has been queried whether a wireless equipment on the sledges would not have averted the tragedy to Captain Scott's party. They were only eleven miles from One Ton Depôt, where there was food, and, but a few days before, help, when disaster overtook them. One Ton Depôt itself was 150 miles from the base at Cape Evans. While it would have been possible for a wireless station at Cape Evans to make its signals heard at One Ton Camp, the explorers would have required an equipment rather heavier than it might have been thought worth while to carry to transmit a reply.

* * *

In Polar exploration, of course, the minimum of weight is essential. One of the lightest types of wireless equipment made is of the "Knapsack" type for conveyance by hand. The total gross weight of the complete "station" is only 86 lbs. It can be erected in six minutes by four men, and has an approximate maximum range of twelve miles. It will be highly interesting to note from Captain Amundsen's experience with his wireless equipped sledges what future radiotelegraphy has in Polar exploration.

* * *

The world watched with a deep pity the breaking of the sad news to Mrs. Scott. The wife of the gallant explorer left home for New Zealand to welcome her husband on January 4th, and was aboard the s.s. "Aorangi," not far from Hawaii, when the news of the fate of the polar party reached England. To wireless it fell to convey the message that her mission was ended. It was the first news of her husband since his last letter, dispatched ere he began his dash to the Pole in November, 1911, which came to hand in March. A wireless message was sent to the s.s. "Aorangi," which was due at Hawaii on February 11th. Throughout the night messages were being sent over the ocean to the steamer on which Mrs. Scott was hastening joyfully to keep the promise she had made in her farewell words to Peter, her blue-eyed, fair-haired, three-year-old boy, to fetch *him* home. The latest messages from Honolulu state that Mrs. Scott received the news by retransmission from vessels within the wireless zone.

Amongst the members of the Shackleton expedition to the South Pole was a young Australian explorer, Dr. Mawson. On his return with the party he decided to retrace his steps in order to systematically explore the land which had just been opened up to the world of men by these intrepid adventurers. Accordingly he, at the head of a party of thirty-two scientists, has for more than a year been engaged in important researches over this virgin territory—the coast extending westward for 2,500 miles.

The main exploring party was landed in Adelie Land, where a base was formed preparatory to another journey to the magnetic pole. Other parties were landed to the westward by the "Aurora," and will be taken off by the vessel on her return journey. She sailed from Hobart last month for this purpose. A wireless telegraphic station was established at Macquarie Island by the expedition in 1911. This is midway between Tasmania and the Antarctic Continent. Since then another wireless installation has been made in Adelie Land, and the connecting link of Macquarie Island will enable Dr. Mawson to communicate the adventures and discoveries of the three parties to his agent in Hobart. With characteristic enterprise the *Daily Chronicle* has made arrangements with the agents, whereby they will receive the messages immediately they have come through to Hobart, and will publish them at the earliest opportunity. This is the first time that wireless communications have been telegraphed direct from the Polar regions, and marks an interesting stage in the progress of journalism.

* * *

Scarcely a day passes but the word "wireless" appears in the headlines of our daily newspapers. By wireless, Shakri Pasha, the commander of Adrianople, transmitted to Constantinople from the beleaguered city the news of his losses in the bombardment; by wireless, too, the *Daily Mail* was able on February 17th to secure from the Rev. Albert Knight an exclusive message explaining his sensational disappearance from Leeds, and his communication to the Bishop of Ripon resigning Holy Orders. This message reached London in a very roundabout fashion. It was transmitted by wireless from the steamship "Port Lincoln" to Luderitzbucht, on the coast of German South-West Africa, and from there sent over the land telegraph to Swakopmund in the same area. From Swakopmund it was sent to Capetown, thence to England.

* * *

Public clocks, which cause endless delay by faulty regulation, will shortly be placed

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under strict supervision. They are to be regulated every minute by wireless. The Imperial Post Office in Germany is about to attempt the novel method of controlling public clocks throughout the country by means of wireless telegraphy. Most people, of course, are familiar with the electric clock which, under the influence of the "master clock," has its hands moved every minute. By this means all clocks in a building controlled by the "master clock" record the same time. The new wireless scheme is more far-reaching. From one great central clock situated in Fulda—a large German wireless telegraph station—signals will be sent out once every minute which will control public clocks throughout the whole country. By wireless every signal given once a minute will actuate all the public clocks fitted with the necessary receptive mechanism.

* * *

A recent issue of *L'Economista Italiano* of Rome contains an interesting account of the development of the Marconi organisation, and points to the excellent position in which the Italian Government has been placed by the use of Mr. Marconi's inventions. In an interesting narrative describing the progress of radiotelegraphy our contemporary shows how that progress has been almost entirely due to Mr. Marconi and the company over which he presides, and it adds that "all those who had confidence in the work of Guglielmo Marconi, and who had invested capital in it, have had the double satisfaction of contributing to the development of an industry which has conferred far-reaching benefits upon mankind, and which has amply repaid those who had the foresight to avail themselves of a profitable investment. Moreover, they are associated with an undertaking which is splendidly organised throughout two continents—Europe and America—and which is only just beginning to be extensively applied in Africa and Asia, two continents which afford exceptional scope for wireless telegraphy."

* * *

The principles of wireless telegraphy, discovered by Mr. Marconi, has been adapted to means for detecting thunderstorms. A small aerial wire, similar to that used for wireless telegraphy, collects the electricity from the atmosphere and transmits it to a coherer, or detecting device, connected to the earth. When a clap of thunder takes place the electricity produced passes from the aerial wire, through the coherer, to the earth, and closes a delicate electric circuit, when a needle is jerked. This needle traces a line on a piece of paper attached to a revolving cylinder. Each jerk of the needle caused by a discharge of atmospheric electricity produces a V-shaped deviation in the line traced. In order to measure the actual strength of electrical disturbances in the atmosphere a special apparatus has been designed. A delicate detector is connected with a sensitive meter, a pointer on the dial of which registers the strength of the discharges. The aerial wire collects the electricity from the atmosphere and discharges it through the detector. The pointer of the meter then indicates the amount collected.

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Mr. F. E. D. Pereira lectured, under the auspices of the Holy Trinity Literary and Debating Society, on wireless telegraphy during the past month. There was a large audience, and considerable interest displayed in the lecture, which was made more attractive by a number of experiments and the display of lantern slides. Mr. Roland Shelley, who was largely instrumental in arranging for the lecture, proposed a vote of thanks to Mr. Pereira.

Mr. Richard Kerr, who is well known all over the country, recently delivered his interesting and popular lecture on "Wireless Telegraphy" in the Corn Exchange, Maidstone. There was a large attendance of the public, over which the Mayor presided, and Mr. Kerr kept his audience deeply interested throughout the evening by his racy story of the history of the development of wireless telegraphy, which was made even more attractive by the experiments which he carried out. Mr. Kerr is a very popular figure on public platforms with his lecture on "Wireless Telegraphy," and his success is well merited by the manner in which he treats his subject. After an evening with Mr. Kerr, the public cannot be excused if they have failed to realise that, through the genius of Mr. Marconi, an abstruse scientific phenomenon has been turned into an instrument of great public utility.

Rev. H. V. Gill, S.J., B.A. (Cantab), recently delivered two lectures on "Electric Sparks: Their Use in Wireless Telegraphy," at the Royal Dublin Society. The reverend lecturer reminded his audience that the Dublin *Daily Express* was the first newspaper to utilise the Marconi system for sending Press messages, when an installation was set up on the occasion of a regatta, held some years ago at Kingstown, and the results were announced by wireless telegraphy.

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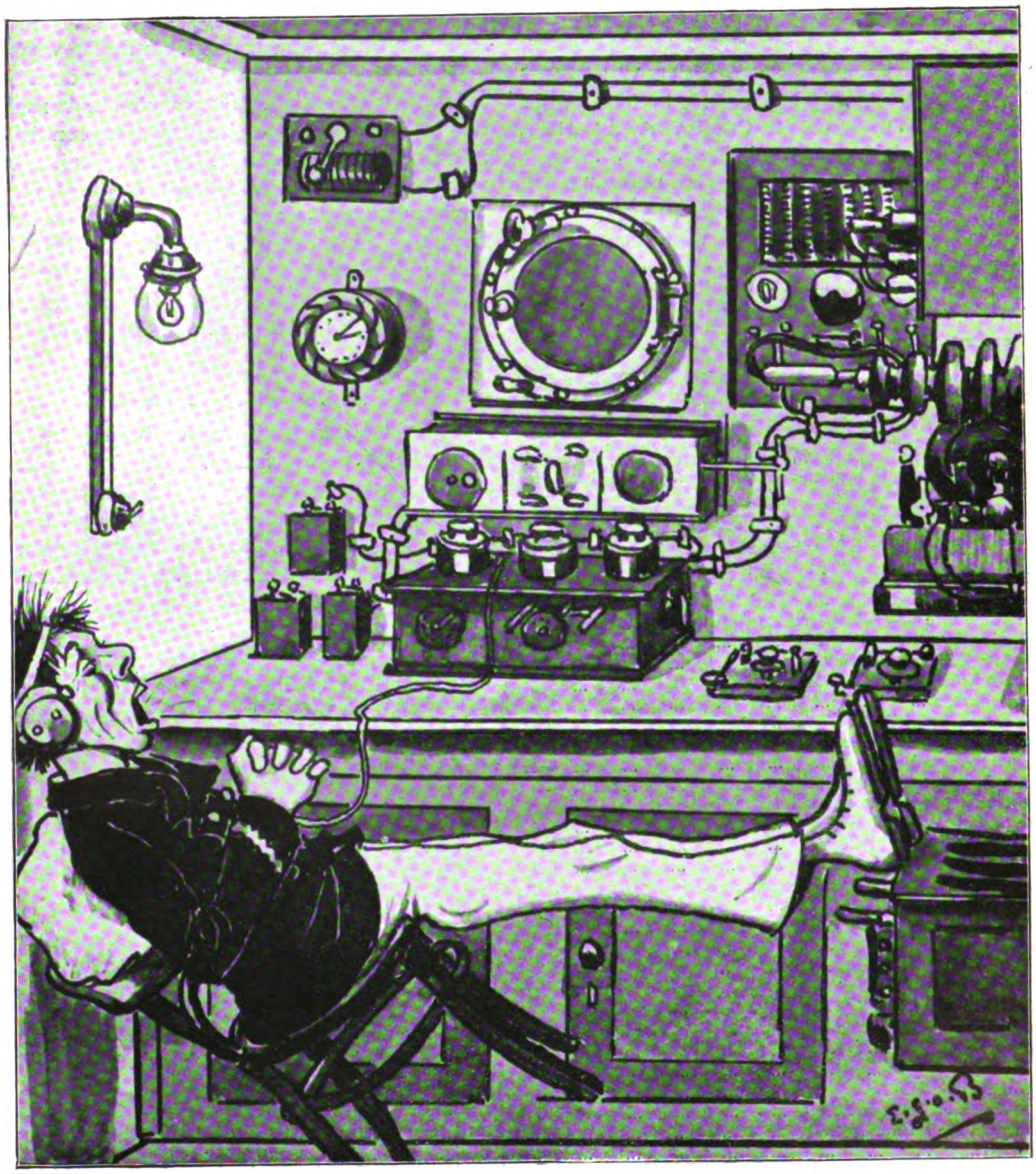

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THE MARCONIGRAPH

An Illustrated Magazine for all interested in WIRELESS TELEGRAPHY, published monthly by MARCONI'S WIRELESS TELEGRAPH COMPANY, LIMITED, Marconi House, Strand, London, W.C.

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The Editor will be pleased to receive contributions; and Illustrated Articles will be particularly welcomed. All such as are accepted will be paid for.

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### The Share Market

London: February 24th, 1913.

Business in the share markets during the past month has been at a low ebb. The prolonged uneasiness with regard to the political situation in Eastern Europe, combined with the scarcity and dearness of money, has caused an all round depression. Scarcely a single market has been exempt from the prevailing conditions, and in some sections the fall in values has been very considerable. Although dealings in the various Marconi issues have been very restricted, the market has been a firm one, and the shares have moved up to a moderate extent.

Prices, as we go to press, are: Ordinary, 4⅜; Preference, 3¾; Canadian, 17s. 9d.; Spanish, 1; American, 1⅛.

### Mr. Godfrey C. Isaacs

At a meeting of the executive of the Mid-Essex Liberal Association, held at Chelmsford on February 17th, it was decided to appoint a deputation to wait upon Mr. Godfrey C. Isaacs, of the Marconi Company, to request him to fight the division against Mr. Pretyman at the next election.

### Alleged Criminal Libel

At Bow Street Police Court, on February 19th, Mr. R. D. Muir applied to Sir Albert de Rutzen, on behalf of Mr. Godfrey Charles Isaacs, managing director of Marconi's Wireless Telegraph Co., Ltd., for a summons against Mr. Cecil Chesterton, the editor of a newspaper now called the *New Witness*, formerly called the *Eye Witness*.

The summons applied for, said Mr. Muir, was in respect of a series of libels begun in the *Eye Witness* and continued in the *New Witness*. They were libels of a very serious character, directed principally against Mr. Isaacs, as managing director of the Marconi Company, and they were also directed against him in his personal capacity. They were contained in the issues of the paper dated August 8th, 15th, 22nd, September 26th, October 3rd, 17th, 24th, 31st, November 14th, 21st and 28th, and December 5th, 1912, and January 2nd, 9th, 16th and 23rd, 1913. The papers were before Mr. Justice Bucknill in Chambers, and he made an order, dated February 18th, that Mr. Isaacs be at liberty to institute criminal proceedings for libel against Mr. Chesterton.

The magistrate granted the summons, and made it returnable for February 26th.

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# "The Wireless World"

THIS issue of THE MARCONIGRAPH is the last to bear the familiar title on its cover. The April issue will appear in an entirely new guise, under the title of *The Wireless World*. Its size will be considerably increased and its scope extended to deal, as its name indicates, with everything of interest in the world of wireless telegraphy.

This change is a sequel to the enormously increased popularity of the magazine, not only amongst those who are interested in radio-telegraphy from a professional or scientific point of view, but amongst the general public, who, more and more, are taking a keen interest in wireless progress.

The record of the magazine established by us is one of unchecked growth. The first issue, in April, 1911, contained 16 pages. As the months passed it was found necessary to add to the number of pages, and on its first birthday 52 pages were presented to its readers. Next month the issue will consist of 96 pages.

Two years of life will thus show *The Wireless World* at six times its original size, with every prospect of a further increase being necessary. Of what other magazine can the same be said ?

The April number of *The Wireless World* will mark a notable development of the magazine, not merely in size, but in contents. It will make a strong appeal equally to the scientist, the engineer, the operator, the amateur, and to that vast body of the public who take an interest in things scientific. As has been indicated, its pages will summarise and comment on the developments in wireless telegraphy all over the world, and will contain a variety of scientific and general information written in a popular and easily comprehensible style.

From time to time eminent scientists will contribute articles on various aspects of the subject, and it is hoped that the results of many important investigations will find the light in its columns.

The chief points of interest in papers read before scientific bodies will also be presented. A feature will be made of useful hints and advice to amateurs. For business men a monthly record dealing with the commercial development of wireless telegraphy will be included. Short stories, light verse, and sketches are an innovation which will help to enliven its pages and render it an indispensable magazine.

Never at any time abstrusely technical, *The Wireless World* will aim always to interest the general public, and give them a really good understanding of the subject.

To this end it will publish a series of twelve special articles, written in simple language by experts of wide practical experience, which will take the uninitiated right through a course in wireless telegraphy. These articles will be easily intelligible to those who have no knowledge of wireless work or electricity. They will explain the principles of electricity and magnetism as far as they apply to wireless telegraphy, and will describe the function of each piece of apparatus in a wireless station.

On the conclusion of the series *The Wireless World* will set a number of questions to its readers based on these articles. Valuable prizes will be awarded for the best papers submitted. Particulars of this will be published in the April number.

To boy scouts, amateur wireless clubs, and Territorials these articles will have a strong interest, as they may have a profitable outcome.

The demand for the April number of *The Wireless World* will be a large one. A copy on the bookstalls will cost 3d. ; it may be had post free for a year for 5s.

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# The Imperial Wireless Scheme

WHEN the Select Committee of the House of Commons on the Marconi Contract met on Wednesday, January 22nd, practically the whole of the sitting was occupied with the evidence of Mr. William R. Lawson.

The course of the examination-in-chief, which was conducted by Mr. Douglas Hogg, counsel who appeared on Mr. Lawson's behalf, covered a review of the Agreement from a business point of view; the treatment of the Marconi Company as contrasted with the treatment by the Post Office of the old cable companies and the National Telephone Company; the financial position of the Marconi Company and the Marconi share market; and the position of the Post Office in the negotiations.

Mr. Falconer asked witness whether, as a member of the Stock Exchange, in the course of his business he had had any dealings in Marconi Shares; if so, what were they? He replied, "I had two dealings last year—the only dealings I ever had—one was in May, I think, and the other in August."

Were you a seller or a buyer?—I sold two lots of fifty shares for contango purposes.

By Mr. Primrose: Did your profit depend upon the shares falling, or did it depend upon the shares going up?—My personal profit was in the contango in the first place, but I took the risk of the market going up or down.

Under which circumstances would you get your profit, if they went up or if they went down in this particular transaction?—I had the profit on them going down, certainly.

On Thursday, January 23rd, Mr. Lawson, who had declared in his examination-in-chief that the Government was "indirectly associating itself with a huge Stock Exchange gamble," was questioned by Mr. Falconer on the contrast he had made between the Post Office's attitude in having charged the Telephone Company a 10 per cent. royalty and its "generous attitude" towards the Marconi Company. Mr. Falconer pointed out that the Telephone Company got a licence as well as 90 per cent. of the receipts, while the Marconi Company got no licence, got none of the receipts except a 10 per cent. royalty for their patents; and, further, that the Marconi Company agreed to reduce the rates on messages one-half; and the witness admitted after considerable questioning that the terms offered by the Marconi Company were much more favourable to the Government.

Mr. Lawson admitted that at the time there was perhaps no company in the same position as the Marconi Company. On the other hand, nobody knew what the Marconi long-distance stations were capable of doing.

On Wednesday, January 29th, Mr. Lawson, again examined by Mr. Falconer, M.P., agreed that if the Postmaster-General had satisfied himself that there was no other choice, a 10 per cent. royalty on the gross receipts might be reasonable.

Mr. Falconer: Then it comes to this—that there was no other company which could be relied upon to do this work over the distance to such an extent as would justify the Government in accepting them as contractors and paying the large sums under the contract?—The Witness: That there was no other company on the same level and of the same capacity as the Marconi Company I admit. If the thing had to be done within six months, then probably they were the only people who could do it. And a sound principle for the Government to proceed upon would be to make an agreement with them on the lines that they should be free to adopt any other system at any time if they thought it better to do so.

Would not that follow?—Yes, I admit that.

As to his statement that wireless telegraphy had never been considered from the point of view of its effect in naval warfare, he meant to say that the Admiralty had not satisfied themselves on the question of risks of wireless telegraphy in naval warfare, and how to minimise them. He admitted that he had no inside knowledge of what the Admiralty have been doing.

"Then you say," continued Mr. Falconer, "the most obvious cause of the failure of this agreement was the absence from first to last of an Imperial policy of wireless telegraphy. Have you anything new to say in justification of that statement?"—No.

He withdrew the statement, "There is no mention of the subject ever coming before the Cabinet," which suggested that in the negotiations the Postmaster-General acted without the authority of the Cabinet.

After considerable questioning on a statement that the matter was "casually taken up by the Committee of Imperial Defence," Mr.

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Lawson admitted that it was not precisely correct to say that the matter " drifted into the hands of the two Committees." Later he substituted the word " passed " for " drifted."

Mr. Lawson agreed also that he approved of the principle of the State owning the six long-distance stations which the Government wished to have erected, and further conceded later that the attitude of the Government, which he had described as " illogical, inconsistent, and untenable," would be " logical and consistent " when the Poldhu and Clifden stations were acquired. His contention that the Government had saddled themselves with a service to be carried on for the benefit of the Marconi Company he admitted went by the board, for in supplying apparatus the " Marconi Company would have no advantage ; they would be on the same level as other people." He did not mean to suggest from his statement that " the State was indirectly associating itself with a huge Stock Exchange gamble," that the Postmaster-General, or any of his subordinates, or any Minister, or any official of any department —the Admiralty, the Post Office, or the War Office—took part in it. He meant it only in the sense that the managing director of the company from time to time made communications to the Press. He referred only to rumours current at the time, and these he had never been able to verify.

Mr. Falconer referred the witness to the following sentence from his *précis* of evidence : " For the first time is admitted the liability of the State to pay a huge annual royalty to patent exploiters."—Mr. Lawson replied that it was especially dangerous for the public that such companies with an enormous nominal capital should have a free hand to put up patents. He agreed that the company had carried on a larger business in wireless telegraphy than anybody else in the world.

What do you mean when you make use of words like " patent exploiters " about people who are developing an industry of that kind in this country ? Is it merely as a term of opprobrium ?—No, it is not.

Is that what is meant when you use the words " patent exploiters," that in connection with some of the companies which they have formed for the purpose of working these patents in other countries, they have over-capitalised ?—Certainly.

Pressed on the point that the British company was over-capitalised, witness said the market value was over-capitalised, but that that was not the fault of the Marconi Company. That the amount at which the Marconi companies were capitalised would not in any way affect the amount of the rates which might be charged by the Post Office for messages sent by the Imperial Wireless Scheme, he acknowledged.

On the resumption of the examination on Thursday, January 30th, Mr. Lawson withdrew the statement that wireless telegraphy had never been considered from the point of view of its effect on naval warfare. The next statement in his examination-in-chief that " by giving 10 per cent. royalty to the first patentee it employs, the Post Office effectually shuts itself out from the services of all other patentees," he also consented to withdraw. He agreed that the word " properly " should be inserted in what Mr. Falconer described as the peculiarly offensive suggestion that negotiations were " carried on behind closed doors." That the treatment of the cable companies " was all in striking contrast to the favours that had been heaped on the Marconi Company " Mr. Lawson withdrew, agreeing that with regard to the cable companies there could be no analogy, and therefore no comparison with the agreement under discussion. The witness said that his assertion that " Mr. Godfrey Isaacs seems to have dictated terms to the Post Office " was based on the statement of more than one official that they had acted under compulsion and could not help themselves. In a review of the negotiations he admitted that there was no dictation. " I simply say," he remarked, " that Mr. Godfrey Isaacs was more successful in the negotiations than the Post Office."

Towards the conclusion of the sitting the witness, in order to justify his statement that " radiating from this common centre (the Marconi Company) we find half a dozen tentacles all heavily loaded," was taken through a list of allied companies, and admitted that the financial condition of the Marconi International Marine Communication Company was sound ; that the Canadian Company was not over-capitalised ; that, tested by the market value, he could not say that the Spanish Company had not been overloaded, and he could not say it had been ; and that he could not say that the capital of the Russian Company was overloaded. The use of the word " tentacles " was not intended to imply any reproach. He meant that in proportion to their earnings the affiliated companies were very heavy capitalised.

He agreed that " they were all heavily loaded " was an overstatement, and withdrew it.

Mr. Lawson's attention was drawn to the letter which he addressed to the chairman of the Committee on November 25th, 1912, and which arose out of an article written by him for the *National Review* of that month, to which the *Spectator* afterwards referred.

The letter contained two statements :

(1) A reference to a paragraph which appeared in the *Financial News* of January 24th, " the very day on which, according to the

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Postmaster-General, the first Marconi tender was signed"; (2) "A very few days later (after October 11th) the Postmaster-General had to admit that not a single one of the Dominion Governments had followed his example and saddled itself with the Marconi contract."

Having regard to the fact that in answer to Sir Ryland Adkins, Mr. Herbert Samuel said in the House of Commons that:

> "These statements, which have appeared in the *National Review*, and have been reproduced textually in the *Spectator*, are totally false, like much else that has been written in regard to this contract. No agreement of any kind was made with the Marconi Company with respect to these stations until March 7th, 1912, when their tender in general terms was accepted, the contract itself being signed on July 19th. I have made no reference to any date. . . . The South African Government is participating in the contract, and the statement which I am alleged to have made is a mere invention"—

Mr. Lawson was asked why he had put into the Postmaster-General's mouth the words "that the Marconi tender had been practically accepted"? The witness replied that he was condensing what the Postmaster-General had said. He had not idea of imputing anything to the Postmaster-General; the idea that he was in league with the Marconi Company was absurd.

Ultimately he said he desired to withdraw the whole of his evidence with reference to the Government being tied to the Marconi Company.

The question of monopoly then came to the fore, and Mr. Lawson agreed, in response to Mr. Falconer's queries, that the Marconi Company were in a financial position to carry out the contract; that they had got a system which had been proved to be capable of communicating across the Atlantic, that they had a large staff of highly-qualified engineers and constructing people which could be made available for the erection of the Imperial stations, and that there was more important consideration than that of patents. Ultimately he conceded that the Marconi Company had no monopoly.

The examination of Mr. Lawson by Mr. Falconer on Wednesday, February 5th, was devoted to an attempt to ascertain the scope of the Stock Exchange transactions in Marconi shares, and came to a conclusion with a number of questions as to the circumstances under which the witness began his attack.

Lord Robert Cecil asked the witness if he intended to charge any Minister with improper conduct. He replied that he did not intend to make any charge. He admitted that some of the words in an article in the *Outlook* for August were rather unfortunate, and went beyond what he really meant. He withdrew later any suggestion that Cabinet Ministers were openly promoting a monopoly. He confessed that he could not suggest the exact meaning for a sentence suggesting that the "Postmaster-General was closely and peculiarly associated with the Marconi Board."

Questioned about another passage concerning "the mysterious relations that have obtained between certain members of the Government and the Marconi Company," the witness admitted that it was too lax an expression, the only basis for which was the telegram sent by Sir Rufus Isaacs to New York, and that "mysterious," too, was an unfortunate word. He was only thinking of the rumours that certain Ministers had been financially interested. The articles, he said, were written under strong provocation, and, he maintained, in the public interest, without malice, not for any selfish purpose. His statement in one article that "three members of the Government have figured more or less in this suspicious episode" was professedly based on public rumours.

Mr. Lawson wished it to be clearly understood that he referred to the rumours only for the purpose of getting them denied, and having a proper inquiry made into the Agreement.

> "In some passages I admit I have gone too far, and have given the impression that I was making charges against Ministers. So far as I have done that, I want to say most emphatically I did not intend them. I did not want to harm Ministers personally."

Lord Robert Cecil: And you made these statements about Ministers in order to achieve a purpose?—I say that in the heat of writing the articles I have written several things I should certainly not write again.

Thursday, February 8th, was the seventh and last day of Mr. Lawson's appearance before the Committee. In reply to Mr. W. Redmond, he admitted that he would not write again any suggestion that the Chancellor of the Exchequer would be a party to jobbery in any way. Asked who were the three Ministers whose names (according to his articles) "figure prominently in these disclosures," the witness said he was only referring to rumours.

Eventually witness admitted that he had made no special effort to find out whether there was the slightest foundation for these rumours, or for those implicating the Chancellor of the Exchequer and the Postmaster-General, to whom he had referred. He had not a single shred of evidence that these rumours were true. Mr. Lawson withdrew his

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statements that the Government tried to sell the Lodge-Muirhead patent because they were in league with the Marconi Company, and that the Government were in league with the company.

Mr. Redmond elicited from the witness that he had no evidence of any kind to support the charges before the Committee. Finally, in answer to his counsel, Mr. Hogg, Mr. Lawson said his articles were the expression of his honest opinion at the time they were written.

On Monday, February 10th, Mr. Walter Guinness, proprietor of the *Outlook*, was called to give evidence. He was abroad or ill at the time of the publication of all but the first of Mr. Lawson's articles, he explained in reply to his counsel, Mr. Hogg. He had expressed a wish that all personal attacks should be avoided, and he regretted if anything had appeared which could possibly be construed as a suggestion of improper financial conduct on the part of Ministers. He could certainly not justify the attacks on individuals, but he thought that when rumours were so widely prevalent as these were, the rumours which he certainly thought were not well founded, their origin ought to be explained.

He agreed, in answer to Mr. Falconer, that vague charges should not be made against Ministers without there being any ground for them; they ought not to be referred to in such a vague way that the Minister concerned is not able to take action. He did not think there was anything in the articles to justify action, and he should have felt very great regret if there had been any such attack. He did not think any charges were intended. He thought that the Postmaster-General, as to whose honour he had not the slightest doubt, acted rather unwisely in the way in which he dealt with the Marconi contract.

Mr. Edward Oliver, editor of the *Outlook*, denied that the articles accused Ministers of personal corruption; the reflection was in a political sense. He held that the articles were a most valuable series, and was proud of them. The circulation of the paper did not go up in consequence of them.

He had never suggested that the Attorney-General had used his influence as a member of the Government to induce the Government to give the contract to the Marconi Company. He admitted that "perhaps" he intended his readers to form an opinion that the Attorney-General was in the background as a mutual friend of the Government and the company. If you could not make a suggestion like that in a political paper, political comment became impossible. He admitted that he had nothing to prove that the Attorney-General acted in the negotiations.

For refusing to give the name of persons who had supplied him with information on which he had criticised the Government's agreement with the Marconi Company, the Select Committee decided, on February 12th, to report Mr. Leo Maxse, editor and proprietor of the *National Review*, to the House of Commons as a contumacious witness.

When the matter arose in the House on the following day the Prime Minister, on the grounds that the Select Committee had adjourned for the Session, and in the circumstances and having regard to the period of the Session, and to the fact that experience has shown that the House of Commons should proceed in matters of this kind only after due deliberation, stated that he was not prepared "to assume the responsibility of advising the House to take any immediate action."

Cross-examined by Mr. Parker, Mr. Maxse said he declined to give the names of any persons who had supplied him with information, on the ground that it was given to him in an editorial capacity, and it was his duty to respect the confidence placed in him. He would never have taken a hand in the matter unless he had been satisfied from inquiries he made that, at any rate, there was strong ground for suspicion.

He admitted he had not what would be regarded by lawyers as evidence that Ministers were connected with the Marconi activity on the Stock Exchange, but there was a very widespread belief, held rightly or wrongly, that Ministers participated in the gambling. He declined to produce any letters from correspondents bearing on the rumours that Ministers were financially interested in the Marconi Company; and, therefore, after a deliberation in private, the Committee passed a resolution that he be reported to the House.

The Committee adjourned until next Session.

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**Interchange of Correspondence**

The application of Marconi's Wireless Telegraph Company to be released from the contract on the grounds set forth in the company's letter to the Postmaster-General on January 15th (THE MARCONIGRAPH, February, p. 503) was submitted to the Select Committee, who ordered the following letter to be sent to the Postmaster-General on January 27th:

> SIR,—The Select Committee on Marconi's Wireless Telegraph Co. (Ltd.) Agreement direct me to inform you that at their meeting to-day they have come to the following resolution:
>
> "That the Postmaster-General be informed, in reply to his letter of the 17th instant, that the Committee having now

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heard a statement from Mr. Marconi and the evidence of Sir Alexander King, are of opinion that, pending further inquiry, the Committee do not consider themselves in a position to advise the Postmaster-General as to the desirability of releasing the Marconi Company from the agreement entered into in July, 1912.

Your obedient servant,
R. BAILEY,
*Clerk to the Committee.*

Mr. Herbert Samuel replied as follows on January 28th:

DEAR SIR ALBERT SPICER,—I beg to acknowledge receipt of the resolution passed yesterday by the Select Committee on the Marconi Contract referring to my letter to yourself of the 17th.

In that resolution the Committee say that, pending further inquiry, they do not consider themselves in a position to advise me as to the desirability of releasing the Marconi Company from the agreement entered into in July, 1912.

From the conversation which has subsequently taken place between us I gather that the phrase "pending further inquiry" does not imply that the Committee propose to engage in further inquiries with a view to advising as to the desirability of releasing the company, and that meantime they would prefer that I should withhold a reply to the company's request. I understand that the resolution is to be taken to convey that until the Committee's general investigation into the subject included in their reference was further advanced they would not be in a position to advise on this particular point, and would not wish to intervene meanwhile with respect to any measures I might think fit to take. I propose therefore to proceed on that assumption.

Yours very truly,
HERBERT SAMUEL.

The following letter was sent on February 5th by direction of the Postmaster-General to the company:

GENTLEMEN,—With reference to your letter of the 15th ultimo, in which you ask that the Government will agree to the company's treating the contract of the 19th July, 1912, as no longer binding upon either party, I am directed by the Postmaster-General to express his regret that, after full consideration, His Majesty's Government are unable to accede to the company's request.

The Postmaster-General regards the delay which has taken place as very regrettable, but it is the consequence of the provision, embodied in the contract, that it should not take effect until approval had been given by the House of Commons. The fact that delay has occurred from this cause cannot be regarded by the Government as an adequate reason for releasing the company from their obligations.

I am to add that the Postmaster-General proposes to publish this reply.

I am, gentlemen,
Your obedient servant,
A. F. KING.

On February 6th the following letter was sent by the Marconi Company to the Secretary of the General Post Office:

SIR,—We have to acknowledge the receipt of your letter of the 5th instant. Whilst agreeing with the Postmaster-General that the delay is a consequence of the provision in the contract, we do not understand that it is suggested that such delay is a natural or necessary consequence, or that it was such as was contemplated by either party to the contract.

For the reasons set out in our letter of January 15th, we feel we are morally entitled to ask that the agreement should be considered as no longer binding on either party, and we had every hope that in view of the facts to which we called attention, and which are not in question, our request would have commended itself to His Majesty's Government, whose decision we now learn with much regret.

We should add that in addition to the matters in respect of which we were being prejudiced, and to which we have already called attention, we have been obliged to reserve, for nearly a year, to enable us to carry out the work which we have undertaken, a sum exceeding £300,000. This is a serious matter for a business company, and if continued would necessarily tend to restrict and hamper our commercial programme generally.

Apart altogether from the moral position, we thought it well to take the opinion of Sir Robert Finlay as to our legal rights, and he has advised that we are now entitled to intimate that unless the Postmaster is in a position to definitely confirm the contract by March 1st next we will treat such contract as at an end.

We should, however, be reluctant to rely upon our legal rights did we not feel that we had strong moral grounds for the position we are taking up.

In these circumstances we would venture to ask that our letter of the 15th ultimo be further considered, and we trust that as a consequence we may not be put under the obligation, through no fault of our own, of

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rescinding a contract entered into with His Majesty's Government.

Inasmuch as this matter has become public, and your letter of yesterday has been published, we would ask that publicity be also given to this letter.

I am, Sir, your obedient servant,

GODFREY C. ISAACS,
*Managing Director.*

To this the Postmaster-General caused the following reply to be sent to the company on February 15th :

GENTLEMEN,—In reply to your letter of the 6th inst., I am directed by the Postmaster-General to say that he can do no more than repeat the conclusions stated in my letter of February 5th, and arrived at after careful consideration—namely, that, while he greatly regrets the delay which has taken place, he cannot admit that the delay has been such as to entitle you to withdraw from the contract.

In view of the deliberations of the Select Committee and of the inquiries that are being made at their request by the Technical Committee, there is, of course, no prospect that a decision can be reached in the matter by March 1st.

I am, etc.,
A. F. KING.

The company's reply on February 20th was as follows :

SIR,—We have to acknowledge the receipt of your letter of the 15th inst., in reply to our letter of the 6th inst. We regret to learn that the Postmaster-General is unable to do more than repeat the conclusion stated in your letter of February 5th.

In these circumstances we are very regretfully obliged to inform you that after March 1st next we shall no longer consider ourselves bound by the contract of July 19th last.

When a definite decision may be taken with regard to the building of the Imperial stations we will be pleased again to take this matter into consideration.

I am, Sir,
Your obedient servant,
G. C. ISAACS,
*Managing Director.*

On January 27th Mr. Marconi attended at the invitation of the Committee, and was asked to state the reasons for his desire to withdraw from the contract. He replied :

" My views on the suggested withdrawal of the Marconi Company from their agreement with the Postmaster-General are expressed in a general way in the letter which the company has addressed to the Postmaster-General, and which is now, I believe, in the hands of the Committee. I understand, however, it is the wish of the Committee that I should give my views at greater length. I am personally a party to this agreement, and I am, of course, very desirous of doing so. There is, however, only one way, in my opinion, that this can be done efficiently, and that is by my giving evidence in reply to all that has been said in this room. It is, I feel sure, the only possible means of the Committee understanding and appreciating the reasons for the course I have adopted. If the honourable members of this Committee do not wish to hear my reasons in full and the evidence which I have prepared in the form which I think necessary, it will be better for me to confine myself to my general views, which are expressed in the letter to the Postmaster-General ; but, inasmuch as my company, my work, and my honour have been frequently attacked during the three months the Committee have sat, if I am to say anything at all, I must be allowed to submit a full reply to those attacks."

Later, the Committee deliberated in private, and on the public being admitted to the Committee room, the Chairman, addressing Mr. Marconi, said :

" The Committee have considered your application to be heard, and they have decided that you be heard in full at a convenient date, probably at the end of the journalists' evidence, and we do not propose to call Mr. Godfrey Isaacs at this stage."

Sir Alexander King, the Secretary to the Post Office, was also recalled, and, in reply to the Chairman, said : " I have told the Committee on more than one occasion that the bargain we had made was, in my opinion, a very good bargain, and if that is the case, as I think it is, it would be a serious mistake to give up a good bargain merely for the sake of sentiment."

Asked what he meant by " sentiment," he replied : " Perhaps I might say sympathy with Mr. Marconi." Continuing, he said : " I cannot help feeling that Mr. Marconi has not been well treated. He has been attacked before the Committee by all and sundry. A large number of people have attacked him, and his system, and his company, and although he is the wireless expert of the age, he has not been given an opportunity of answering those statements. That is all I meant by 'sentiment,' but, of course, as the Secretary to the Post Office, I have to look at it as a business transaction."

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# Contract News

## Some Recent Marconi Orders

The Italian Government has placed further orders with Marconi's Wireless Telegraph Co., Ltd., for two 1½-kw. portable cart sets, nine 3-kw. motor-car stations, while an order has been received from Turin for another of these motor-car stations, and three 1½-kw. sets have been sent to Spezia for installation on battleships, together with one 3-kw. battleship disc set; while the naval department has commissioned two 10-kw. sets for special use. Especially interesting is their order for a 30-kw. land station at Assab, for this is an important position in Eritrea, an Italian possession extending for some distance along the African coast of the Red Sea; and the order demonstrates Italy's keen and increasing interest in her colonies.

The Portuguese Government has also placed large orders, comprising a 1½-kw. set for installation on the battleship "Douro," and the equipment for five land stations which are to be erected at Lisbon, St. Miguel, Funchal, St. Vincent and Oporto. The latter scheme was recently described in THE MARCONIGRAPH.

The Brazilian Government has ordered two 3-k.w. sets for their battleships "Deodoro" and "Floriano," in addition to an order issued by the Brazilian Naval Commission for three 3-kw. ship installations to be fitted on Monitors

The Brazilian Admiralty have placed orders for four land stations—two of 25-kw., and two of 15-kw., to be used for naval purposes.

Several orders have been received from the British Government—one from the Postmaster-General to erect a station at Valentia, Co. Kerry, Ireland, the westernmost harbour in the British Islands; one for fitting the training ship "Exmouth" with a ½-kw. set. (This is an excellent move, as a practical acquaintance with wireless should prove an inestimable benefit to these seamen in the making). While from the War Office has come orders for twelve more cavalry stations.

The Canadian Government have also placed orders for three 1½-kw. sets. Two of these are to be fitted on Cruisers No. 80 and 81, which patrol the Canadian coast for the purpose of protecting the fishing interests, while the third is destined for installation on a Hydrographic steamer.

The Compagnie de Télégraphie sans Fil of Brussels have received orders for fitting the following vessels: "Noorderdijk," "Westerdijk," "Osterdijk," running between Rotterdam and American ports, and owned by the Holland-American Line—The Jylland of Copenhagen. They have also arranged for fitting 1½-kw. sets on the Norwegian steamships "Kristianiafiord" and "Bergensfiord," and have forwarded another 1½-kw. set to Copenhagen.

The following vessels have been equipped with wireless telegraphy by the Debeg: the steamships "Dania" and "Karl Schurz" belonging to the Hamburg-Amerika Line, and the steamship "Aachen" of the Norddeutscher Lloyd Line.

Five 1½-kw. sets and three ½-kw. sets have been dispatched to Rio de Janiero for the Lloyd-Brazillero Line.

The Marconi Company's new factory is now completely fitted, and all apparatus has been removed from Jersey City, N.Y. Already the manufacture of apparatus employs sixty men, and it is expected that this number will be doubled as soon as the work of installing the apparatus of the high-power stations has been commenced. This will take place very shortly.

The Colonial Sugar Refining Co., Ltd., of Sydney, N.S.W., have placed an order with the agency of the Marconi Company in Australia for a 1½-kw. standard ship installation and emergency apparatus to be installed on board their s.s. "Fiona."

The "Fiona" is an up-to-date cargo steamer of 4,471 tons gross register. She trades between Sydney and Fiji carrying sugar and general merchandise. The "Fiona" was expected at Sydney on February 18th.

Some time ago an agreement was signed by Messrs. Burns, Philip & Co., Ltd., for the equipment of their s.s. "Matunga" with a Marconi 1½-kw. ship installation and emergency apparatus. The "Matunga" is engaged in

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regular passenger service between Sydney, Queensland ports and New Guinea.

We have received the following information of contracts entered into and fulfilled during the three months ending December 31st last from Marconi's Wireless Telegraph Company of America.

Seven 1-kw. quenched spark-gap sets have been delivered to the United States Army, while two more have been ordered and are in course of construction.

Two 5-kw. sets have been delivered to a sugar company in Porto Rico.

The Phelps Dodge Company have recently purchased two 2-kw. sets for use in their mines in the West.

One 5-kw. quenched-gap set complete for direct current with gasolene generating plant has been shipped to Manila in charge of a wireless expert. It is proposed to use it in connection with some demonstrations which are to be held in the Philippines, as the Philippine Government is about to enter into a very large contract for the purchase of wireless apparatus, which will be installed throughout the islands.

One 25-k.w. set with gasolene engine has been installed for temporary work at Honolulu.

One 5-kw. quenched-gap set has been installed on the roof of Filene building, Boston, Mass., the offices of the Filene Company, one of the largest dry goods houses in Boston.

Four private yachts have been equipped with wireless apparatus.

Sets have been installed on forty trading vessels.

Two hundred and fifty ships have been equipped with auxiliary sets.

Four hundred and thirteen ships have been refitted with tuning apparatus, as well as fifty

**The following Vessels have been equipped with Marconi Apparatus.**

| Owners. | Name of Vessel. | Installation. | Remarks. |
|---|---|---|---|
| The Eastern Telegraph Co. | c.s. "Levant II." ... | ½ kw. and emergency set | Cable ship |
| The Anglo-American Oil Co., Ltd. | s.s. "Cheyenne" ... | ½ kw. and emergency set | Cargo vessel between Baltimore, Philadelphia, and New York |
| Ellerman Line (Hall Line, Ltd.) | s.s. "Melford Hall" | ½ kw. and emergency set | Trading between England, Bombay, and Karachi |
| The White Star Dominion Line | s.s. "Cornishman" | 1½ kw. and emergency set | Passenger travelling between Avonmouth or Liverpool to Portland Maine |
| " " " | s.s. "Turcoman" ... | 1½ kw. and emergency set | Passenger travelling between Avonmouth or Liverpool to Portland Maine |
| The White Star Line ... | s.s. "Cevic" ... | 1½ kw. and emergency set | Passenger between Liverpool and Australia |
| " " ... | s.s. "Georgic" ... | 1½ kw. and emergency set | Passenger between Liverpool and Australia |
| The Nelson Line ... ... | s.s. "Highland Scott" | 1½ kw. and emergency set | Cargo vessel carrying limited number of passengers between London and Buenos Ayres |
| " " ... ... | s.s. "Highland Corrie" | 1½ kw. and emergency set | Cargo vessel carrying a limited number of passengers between London and Buenos Ayres |
| " " ... ... | s.s. "Highland Loch" | 1½ kw and emergency set | Cargo vessel carrying a limited number of passengers between London and Buenos Ayres |
| The Royal Mail Steam Packet Co., Ltd. | s.s. "Oratava" ... | 1½ kw. and emergency set | Travelling between Southampton, New York, and the West Indies |
| The New Zealand Steamship Co., Ltd. | s.s. "Rimoutaka" | 1½ kw. and emergency set | Destined for New Zealand to make circular trip via Cape Town and Monte Video |
| Ellerman Line (City Line)... | s.s. "City of London" | 1½ kw. and emergency set | Passenger between England and India via Suez Canal |
| " " " ... | s.s. "City of Karachi" | 1½ kw. and emergency set | Passenger between England, Bombay, and Karachi |
| " " " ... | s.s. "City of Poona" | 1½ kw. and emergency set | Passenger between England and India via Suez Canal |
| " " " ... | s.s. "City of Marseilles" | 1½ kw. and emergency set | Passenger between England and India via Suez Canal |
| The Tyser Line ... ... | s.s. "Nerehana" ... | 1½ kw. and emergency set | Cargo vessel destined for the East |
| The Adelaide Steamship Co., Ltd. | s.s. "Willochra" ... | 1½ kw. and emergency set | Travelling in Australian waters |
| The Leyland Line ... ... | s.s. "Lancastrian" | 1½ kw. and emergency set | Carry limited number of passengers between Liverpool and Boston |
| The Allan Line ... ... | s.s. "Scotian" ... | 1½ kw. and emergency set | One of twenty vessels belonging to this line, all of which are being refitted |
| The British India Steam Navigation Co. | s.s. "Ellora" ... | 1½ kw. and emergency set | Travelling in Eastern waters |

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shore stations. This has been rendered necessary in order to fulfil the conditions of existing wireless laws.

Besides the above, numerous foreign vessels have been equipped with auxiliary sets and additional tuning apparatus.

**Orders have been received to Equip or to Refit the following vessels with Marconi Apparatus**

| Owners. | Name of Vessel. | Installation. | Remarks. |
|---|---|---|---|
| The Tyser Line ... ... | s.s. "Whakarua"... | 1½ kw. and emergency set | Cargo vessel destined for Eastern trade |
| The Allan Line ... ... | s.s. "Victorian" ... | 1½ kw. and emergency sets. | The Allan Line were amongst the earliest shipowners to have wireless telegraphy installed on their vessels; but in accordance with their policy of progress they have decided to refit their ships so that their passengers may have the benefit of the latest type of installation. This, it goes without saying, will give them the advantage of the very latest improvements which have been introduced into the 1½-kw. installation, and the superiority of this newest type over the coil set, which it will replace, cannot be overestimated. The route of all these vessels is between England and North America. |
| ,, ,, ... ... | s.s. "Virginian" ... | | |
| ,, ,, ... ... | s.s. "Corsican" ... | | |
| ,, ,, ... ... | s.s. "Tunisian" ... | | |
| ,, ,, ... ... | s.s. "Grampian" ... | | |
| ,, ,, ... ... | s.s. "Hesperian" ... | | |
| ,, ,, ... ... | s.s. "Scandinavian" | | |
| ,, ,, ... ... | s.s. "Ionian" ... | | |
| ,, ,, ... ... | s.s. "Corinthian"... | | |
| ,, ,, ... ... | s.s. "Sicilian" ... | | |
| ,, ,, ... ... | s.s. "Pomeranian" | | |
| ,, ,, ... ... | s.s. "Sardinian" ... | | |
| ,, ,, ... ... | s.s. "Parisian" ... | | |
| ,, ,, ... ... | s.s. "Numidian" ... | | |
| ,, ,, ... ... | s.s. "Mongolian" ... | | |
| ,, ,, ... ... | s.s. "Carthaginian" | | |
| ,, ,, ... ... | s.s. "Alsatian" ... | | |
| ,, ,, ... ... | s.s. "Calgarian" ... | | |
| The Leyland Line ... ... | s.s. "Philadelphian" | 1½ kw. and emergency set | These vessels carry a limited number of passengers, but their transport trade between Liverpool and Boston is very considerable |
| ,, ,, ... ... | s.s. "Kingstonian" | 1½ kw. and emergency set | |
| ,, ,, ... ... | s.s. "Georgian" ... | 1½ kw. and emergency set | |
| ,, ,, ... ... | s.s. "Columbian"... | 1½ kw. and emergency set | |
| ,, ,, ... ... | s.s. "Anglian" ... | 1½ kw. and emergency set | |
| ,, ,, ... ... | s.s. "Cambrian" ... | 1½ kw. and emergency set | |
| ,, ,, ... ... | s.s. "Oxonian" ... | 1½ kw. and emergency set | |
| The Booth Steamship Co. ... | s.s. "St. Vincent" | 1½ kw. and emergency set | Running from Liverpool to Manaos and Brazil |
| The Viking Cruising Co. ... | s.s. "Atrato" ... | 1½ kw. and emergency set | General trade |
| The Ellerman Line (Hall Line, Ltd.) ... ... | s.s. "City of Marseilles" | 1½ kw. and emergency set | Passenger between Liverpool, Bombay, and Karachi |
| Canadian Pacific Railway Co. ... ... ... | s.s. "Empress of Russia" | 1½ kw. and emergency set | Passenger between Vancouver, China, and Japan |
| ,, ,, ,, | s.s. "Empress of Asia" | 1½ kw. and emergency set | Passenger between Vancouver, China, and Japan |
| Union Steamship Company of New Zealand ... ... | s.s. "Aparima" ... | 1½ kw. and emergency set | General trading in New Zealand Waters |
| The White Star Line ... | s.s. "Scotia" ... | 1½ kw. and emergency set | Liverpool to Australia |
| Messrs. J. and T. Harrison, Ltd. ... ... ... | s.s. "Historian" ... | ½ kw. and emergency set | Running between Liverpool and South America |
| The Isthmian Line ... ... | s.s. "Bantu" ... | 1½ kw. and emergency set | |
| ,, ,, ... ... | s.s. "Kentra" ... | 1½ kw. and emergency set | |
| Messrs. Watts, Watts & Co., Ltd. ... ... ... | s.s. "Ascot" ... | ½ kw. and emergency set | The second of this company's steamships to be fitted with wireless |
| The Tyser Line ... ... | s.s. "Marere" ... | 1½ kw. and emergency set | These vessels go eastward to Australia, and New Zealand, and return through the South Atlantic |
| ,, ,, ... ... | s.s. "Niwaru" ... | 1½ kw. and emergency set | |
| ,, ,, ... ... | s.s. "Muritai" ... | 1½ kw. and emergency set | |
| ,, ,, ... ... | s.s. "Mirniro" ... | 1½ kw. and emergency set | |
| Garwin P. Grant, Esq. ... | s.v. "Solgar" ... | 1½ kw. and emergency set | Private yacht |

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## A Message to Mars

JOHN NETHERHOLME had always been a pensive youth. In the village where he was born the old men used to stroke their beards and say: "That 'ere lad will either be a genius or a fool. He's always a-dreaming." Often his parents would find him sitting in the attic reading solemnly and religiously the works of Jules Verne. He would sit for hours reading and pondering over that writer's work, "Seventy Thousand Leagues Under the Sea." He appeared to become entranced whilst reading it, and at night, instead of sleeping the sleep of the healthy child, he would rise up in his bed and recite aloud parts of this interesting book.

But this happened some twenty years ago, and John, although still pensive and dreamy, was neither a genius or a fool.

In the last three or four years he had purchased and studied the latest works on wireless telegraphy. For some time it was difficult for him to comprehend how it was possible to communicate from one place to another without having some visible means of connection. But he had mastered this fascinating question to his own satisfaction, and he was now considering the problem of communicating over any distance he desired. He would argue to himself in this way: If it is possible to communicate over 5,000 miles by means of a powerful electrical apparatus connected to a long wire suspended from a high mast, and the aether as the conducting medium, and knowing that the latter pervaded the whole of the sidereal universe, why should it not be possible to send messages to some of the planets—either Venus, Mars, or Jupiter? He had read with intense interest and fascination the work of Mr. Marconi—how, by sheer perseverance, that brilliant scientist had conquered the many difficulties that at first sight appeared almost insuperable, and how he had in a comparatively short space of time increased the distance of intercommunication from ten to thousands of miles. He had observed that occasionally messages were received over distances up to 6,000 and 7,000 miles, and he averred that it was possible, therefore, to send messages hundreds of thousands of miles; and this problem he promised himself to conquer.

A year or so back he had, whilst travelling from England to the Cape, observed during the voyage that the compass became very agitated, and on inquiring the cause he was informed that it was due to magnetic storms caused by the sun. This was most interesting and useful news, for he remarked inwardly: "Is not this effect tantamount to sending a message from the sun to the earth? and, being so, it is only necessary for me to find out the cause and I shall then be able to send a message to Mars." He was more than anxious to do this, as he had read that people inhabited that planetary body; and, therefore, if successful, it was within the bounds of possibility that he would get a reply.

He concentrated the whole of his mind upon this difficult problem for several days, and one night he solved it in the following way. He built a huge generating station, and erected a gigantic "aerial," supported by four lattice-work towers, each tower being 900 feet in height and 1,000 feet apart. Every part of the "aerial" was carefully insulated to ensure that no energy should be wasted. He very carefully "tuned" up his transmitting apparatus, and assured himself that each part was working perfectly. The generator was arranged in such a manner that he could obtain any "frequency" he desired from 50 periods to 100,000 periods. Having satisfied himself that all was in order, the aerial was disconnected from the apparatus, and he attached it to an instrument which he had specially designed, and which was termed an "aetherometer." This instrument would indicate the natural "frequency" of the aether at any given moment, for he firmly believed that the "aether" was electrically charged to a given potential, and that it was only necessary for him to upset the "fundamental" to achieve his object. He watched the instrument very intently, and took very carefully the various readings over a given time. After finding the "mean" of the different readings he connected the aerial to the transmitter, adjusted the generator to give him the "frequency" he had ascertained, and sent out very slowly his message to Mars. He repeated the message several times, being desirous of giving the Martians every opportunity of thoroughly understanding that he was speaking to them from the earth, and at the end of the message he asked them to answer him by replying "O.K." very slowly. All excitement, he switched over to his receiver and listened, with his whole mind concentrated upon his aural faculties, so that he should be sure to receive the slightest impulses indicated by this instrument. For some few seconds—which seemed an age to him—he heard not the slightest sound, and then, *eureka*, a few dots and dashes were faintly audible! He grasped the table to steady himself, his grip became firmer and firmer, the veins on his forehead stood out like small ropes in his anxiety, and then suddenly the aerial collapsed with an awful crash, the cabin appeared to fall down, the instruments faded away like ghostly ogres, and, with beads of perspiration standing out all over him, he awoke with a fearful start, to find it was only a dream.

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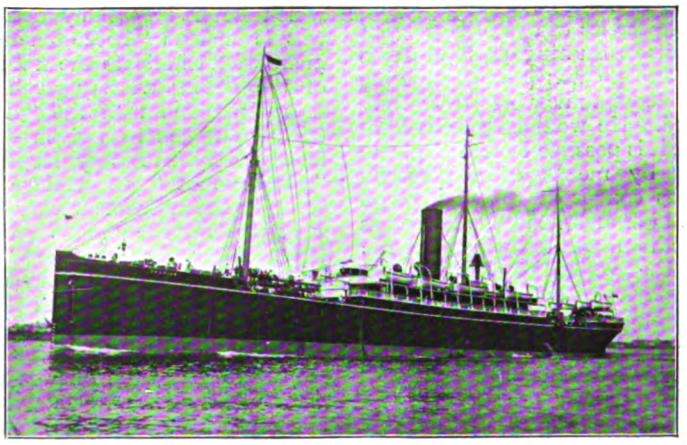
# Maritime Wireless Telegraphy

LACKING a wireless equipment, the s.s. "Abyssinia," with a valuable cargo, was in an unenviable plight 1,100 miles from Halifax. Encountering a heavy gale on January 2nd, her rudder was smashed during the night by a mountainous wave. The rigging of a jury rudder, with the vessel drifting round at the mercy of the seas, was, states a correspondent, a most daring piece of work. There was no proper diving outfit on board, so two men unprotected had to dive beneath the broken rudder in an endeavour to effect repairs. The water was two degrees above zero, and air five degrees below. An unsuccessful attempt made by the British oil-tramper "Rockby" to tow her was followed by an endeavour on the part of the "Abyssinia" to tow the "Rockby," the latter vessel acting as a rudder. For half an hour, as though the tail wagged the dog, the "Rockby" steered the big vessel in front of her, and then the hawser broke. A snowstorm in the night drove the "Rockby" from sight, but she appeared in the morning and promised to report the "Abyssinia's" condition to all ships she met.



*The s.s. "Uranium."*

On the evening of the 9th February there arose a gale of almost typhoonic force which changed its direction from S.W. to N.W. within an hour. In the welter of conflicting seas that resulted the helpless "Abyssinia" was tossed like a cork. Broadsides of water crashed against her and upon her, and in all their united force swept over the decks. The porthole windows, iron frames and attachments were smashed out in one piece, the spar-decks flooded with five feet of water, and the hatches in immediate danger of being battered in. In this plight help was offered by the Dutch steamer "Chester," and later by the s.s. "Cedric," which also called the s.s. "Armenian." The "Armenian," which was preparing to tow the "Abyssinia," was lost sight of during the night in a fog which, when it lifted a day later, disclosed no signs of her whereabouts. When 400 miles from Halifax a lull in the storm enabled the "Abyssinia" crew to arrange a jury rig of wires and cables which brought the rudder shaft under control, and permitted the freighter to be brought safely into Halifax after being uncontrollably adrift from January 2nd to January 13th. During this period so great was the anxiety felt that the Marconi stations at Halifax and Sable Island issued bulletins to all passing ships.

The Camperdown wireless station at Halifax, N.S., was able to render valuable assistance to the Uranium Steamship Company's vessel "Uranium," which, when going dead slow in a dense fog completely obscuring the coastline, grounded on Chebucto Head on January 12th. Gripped fast by a granite rock which worked its way through her bow plates, the "Uranium" notified her plight to Camperdown. Help was promptly forthcoming not only from the Duncan's Cove life-saving station, but from the Government steamer the "Lady Laurier," the s.s. "Caconna" (Dominion Coal Company), and the s.s. "Seal" (J. A. Farquhar & Co.). All these vessels in turn made attempts to tow the "Uranium." Five trying days intervened, during which the station on the s.s. "Uranium" (in charge of Mr. Ridley) and the station at Camperdown (in charge of Mr. L. R. Johnstone) were in continual communication, handling the press of messages for inquiry with praiseworthy celerity. Arrangements had been made to save the wireless apparatus should the vessel have shown signs of going to pieces. Fortunately, however, the weather and sea conditions remained favour-

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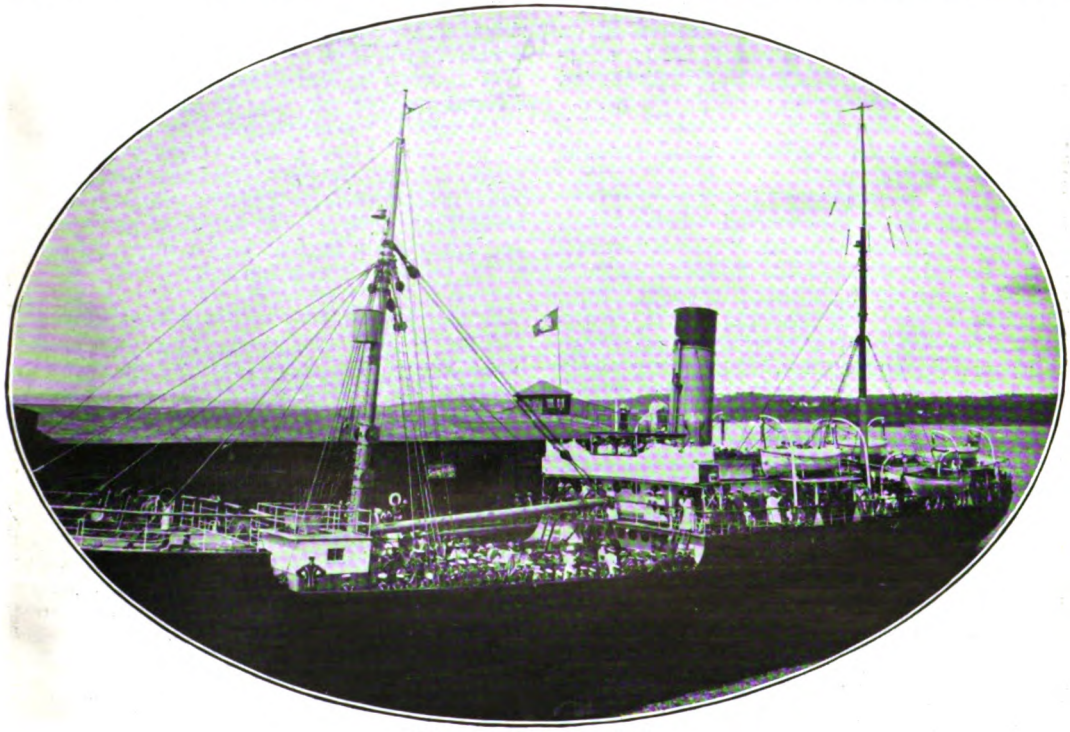
able, and the stranded vessel was successfully hauled off by the Furness Withy Company's steamer "Rappahannock."

✦

For days lashed by a north-east hurricane while ablaze in mid-ocean was the experience—an experience as thrilling as any in the history of North Atlantic navigation—recently reported by the s.s. "Carthaginian" on her arrival at St. John's, Newfoundland. The fire broke out in the hold, and, owing to the difficulty of coping with it under the bitterly cold weather conditions, rapidly made headway. So serious was the situation that a wireless appeal for help for the 100 passengers in jeopardy was flashed out. It was immediately answered by the s.s. "Heligoland," a Danish ship bound from New York to Hamburg, which proceeded in turn to summon other liners. Fortunately, ere they could arrive Captain McKillop, of the "Carthaginian," was able, with the help of the passengers, to get the fire under control and cancel the "S.O.S." signal. The conduct of the passengers, particularly of the women, was, in the captain's opinion, in every way commendable.

✦

Liverpool and the shipping world in general have benefited on many occasions in the past by the enterprise shown by the Booth Steamship Line. Recent events at sea have proved so unquestionably the grave importance of Marconi equipment on board vessels that the latest step taken in this direction by Messrs. Booth & Co., Ltd., receives a very general and genuine appreciation. In consequence of the new wireless regulations brought in by the U.S. Government for passenger steamers, all such with a crew of fifty or over must have two operators. For some time now the Booth Line have carried on their vessels a number of boys from the Navy League Home in Liscard, and knowing that many of these had a knowledge of wireless telegraphy—as a special course of instruction caters for this at the home—they placed them as assistant operators on the New York service of the line. All these boys hold the Postmaster-General's certificate for proficiency in wireless telegraphy. The Marconi Company gives every facility for training, and the boys go through a course of training for three months at the Seaforth station, under Mr. F. E. D. Pereira (the Liverpool superintendent of the Marconi International Marine Communication Co., Ltd.). As a rule, the Booth Line carry four of the Navy League boys on each of their large vessels. With the completion of their three new New York service boats eleven boy operators will be employed.



*The s.s. "Lady Laurier."*

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# The Wrecker of Shark Reef

## A Story of How both Woman and Wireless came to the Rescue

DURING the year 19— the laws of mathematical probability seemed to have been abrogated. That was, at least, the only explanation Dick Traynor could give of the series of disasters which overtook the marine insurance market in general, and his firm of Bertram and Hayward in particular, during that year. Underwriting is, of course, a gamble, but it is a gamble undertaken on strictly scientific lines. By a judicious selection of risks, the chance of total loss is eliminated or, at any rate, reduced to vanishing point.

That is the theory. It is a theory which holds good in nine hundred and ninety-nine cases out of a thousand.

Dick was pursued by the fear that the thousandth case had occurred. It was bad enough for his firm when the "Narva" struck an uncharted reef near the Falkland Islands, and also when the "Eugénie" collided with a Brazilian cruiser and got the worst of the encounter. These disasters were accepted with philosophical equanimity. But they were followed by a bitter disappointment at the foundering of the "Bella Vista" within fifty miles of port, after her captain had navigated her, with funnel gone, deckworks smashed, and rivets sprung, through five hundred miles of tempest. Then followed an autumn gale which appeared to have selected the vessels insured by Messrs. Bertram and Hayward as the special victims of its wrath.

Dick accepted this crescendo of disaster with a very bad grace. When a man is anxious to get married, he expects the Fates to exercise themselves so that he may get a rise in his salary and have a business partnership in prospect to sustain the other partnership. In this instance, however, the Fates were combining to forbid the banns.

### A Philosopher at Tea

His friend, Sammy Verrall, who was in the cocoa trade, had a very simple explanation of these events. He expounded it as they sat together in the Royal Exchange tea rooms—a place where, in Sammy's words, "gamblers refreshed themselves in the midst of their iniquities."

"Fact is," he said, "Providence is against all this sort of thing. If your firm goes bust and flings you on the street, it will be a salutary judgment on your nefarious trade, and a clear sign that you must take up a respectable business with an ethical implication. Like cocoa, for instance, or soap."

"Bosh!" replied Dick.

"Wait! You will be tried as Job was tried—boils, and all the rest of it."

"Things couldn't be worse than they are," responded Dick, seeking for comfort.

"We shall see about that when all your ships come home," replied Sammy, with a chuckle.

It is easy to curse an evil prophet, but difficult to get his prophecies out of one's mind. Dick became obsessed by the certainty of bad luck. The sound of the Lutine bell haunted him. It tolled through his dreams, announcing the loss of every vessel in which he had any interest. It tolled so persistently and diabolically that he began to wish that it would toll for his own funeral.

### The Disaster of Shark Reef

After a week of suspense, there came the news of the total loss of the "Lancelot" on Shark Reef. Dick heard it as a man hears a sentence of death. His firm, as he knew too well, was heavily involved. There was no doubt about the truth of this final catastrophe. The information came from the owners, who had received a cable message from the captain.

When Dick heard the news, he put on his hat and coat, left the office, and walked all the way to a certain house in Hampstead. Amy was in the drawing-room, dreaming, not of the Lutine bell, but of wedding bells.

"Good gracious, Dick," she exclaimed, "what *is* the matter?"

"It's all up," replied Dick, flinging himself on to a chair. "You had better take that ring off. I'm done. Everything's done.

Amy looked at him steadily, and raised her right eyebrow—a signal of defiance.

"Go on," she said, mockingly. "'Henceforth we meet as strangers. Naught remains for me but the clammy silence of a pauper's grave.' And so on."

"It is nothing to joke about," protested Dick. "The 'Lancelot' has broken her back on the Shark Reef. She is scrap iron by this time."

"Oh, Dick! was anybody drowned?"

"No, the whole lot of them got off, confound them."

Amy sighed with relief. "What a blessing!" she exclaimed.

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"Blessing? Oh, woman, lovely woman! And as like as not Bertram and Hayward will sink with that rotten hulk."

"Well," she said, "you are a smart business man, and there are other firms in the world than Bertram and Hayward."

"Talk sense, there's a good little woman. I used to think you had a good business head."

"Perhaps I have. Anyway, you are not to blame if the 'Lancelot' did break her back. You didn't ask Bertram and Hayward to take the risk, did you?"

"Worse than that, I advised them not to take it."

"How worse? You are talking awful nonsense, Dick."

"No, I am not. Every time Bertram or Hayward looks at me, I shall look as if I were saying 'I told you so.' They could forgive me anything but telling them that the risk was a rotten one."

Amy twisted her engagement ring thoughtfully for a minute or two.

"Why rotten?" she asked at last.

"For various reasons. I met the captain once, and hated him at sight. Holy old ruffian he looked."

"Was the boat a new one?"

"No, an old hulk held together with paint. It was bought a year ago by a private syndicate."

"Where is Shark Reef?"

Dick told her, but there is no need to reproduce the data which he gave. The reef is known to mariners under another name, and it lies ten miles to the south of a group of islands not far from a certain trade route. Even the most venturesome tramps give Whale Islands a wide berth, since Shark Reef is not the only hidden danger of that region. The "Lancelot," according to the brief account cabled by the captain, had been navigated by dead reckoning for three days prior to the foundering. Fog, which had not lifted until an hour after she struck, had prevented observations being taken. The "Lancelot," going dead slow, had slid on to the reef, and had broken her back as the tide fell.

### The Feminine View

These were the facts so far as known; and they seemed to rouse a lively curiosity in Amy.

"Are you going to let it rest at that?" she asked.

Dick answered her in an absent-minded tone.

"Oh, there will be an inquiry, of course!"

"Then I should like to be cross-examining that captain for an hour or two," she declared fiercely. "Oh, you may smile!" she added, in response to Dick's expression of patronising amusement. "I mean what I say."

"Not even you could make any impression on Captain Luxmoor," he replied.

"Not if he had a clear conscience."

"My dear girl, you are becoming stagey. What is in your mind, anyway?"

Amy rose and stood before him, accentuating her words with an uplifted finger.

"I am perfectly certain that he wrecked that ship."

"Oh, really now——"

"Yes, I am. I am just as positive about it as if I had seen him do it with my own eyes, and known what was in his evil heart."

Dick surprised himself by laughing heartily. A few minutes earlier he would have thought it impossible to do more than produce a twisted smile.

"You are absolutely magnificent," he said. "I have never seen your Surrey-side character before. Perhaps you won't believe that people do not go about with evil hearts wrecking steamers nowadays."

"Don't they? Why not?"

"Because they don't, my dear."

"That is a woman's answer, and it will not satisfy *this* woman. Why, you yourself have told me often that many steamers are over-insured. What about the 'Lancelot'?"

Dick pondered for a moment or two with knitted brows. "Perhaps she was more than covered," he admitted.

"There! I told you so." Amy was as jubilant as if Captain Luxmoor were already convicted. "And let me tell you this, Dick. If you have not spirit enough to worry this business out and show that old ruffian up, I shall never forgive you. I shall never marry you, never."

"Oh, Amy," he protested. "What rubbish to talk when you know absolutely nothing about the man."

"I know everything!"

Whereupon Dick, showing that he had in him the beginnings of wisdom in such matters, held his peace and took his leave immediately.

### The Artistic Captain

One result of Amy's habit of giving her decision before the case had been heard was that Dick took the most active part in connection with the inquiry into the loss of the "Lancelot." He was determined that Amy should have no just cause for accusing him of lack of spirit. Little or no assistance was given to him by his own principals. They certainly did not share Amy's melodramatic view of Captain Luxmoor. The man's story was so

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clear and so natural that the inquiry would, in their view, be almost a formality.

Such was also the view of the King's Counsel who had been briefed to represent the firm. At least, it was his view until Dick began to sow the seeds of suspicion in his mind. There had been one or two peculiar events in Captain Luxmoor's career—one or two cases where he had been formally exonerated, but left in a distinct haze of suspicion. Moreover, Mr. Hilary Eustace, K.C., was constrained to admit, on the eve of the inquiry, that Captain Luxmoor's statement was so very straightforward as to be intrinsically doubtful. It was, in a word, too artistic to be true.

### Breaking the Rock

The first day was occupied by the captain's evidence. Then began a process which Dick watched with something of the fascination a gambler feels when he plays for high stakes with ruin at his elbow. He had been afraid that Mr. Eustace lacked some zeal for his cause, and had even omitted to master the important points of the case. But he soon realised that Mr. Eustace had understood everything and forgotten nothing. The cross-examination of Captain Luxmoor had not proceeded for an hour before Dick began to cherish the first signs of hope.

Captain Luxmoor's statement had been concerned mainly with the last three days prior to the disaster. Mr. Eustace, however, began his questions at the point of leaving port, and dealt with each succeeding day in patient succession. Dick fretted at the slowness and apparent aimlessness of the process; and at the end of the first day of leisurely question and answer he put his view very strongly before Mr. Eustace.

Mr. Eustace smiled. "Did you have a good look at Captain Luxmoor?" he asked.

"Rather!"

"Well, when a man is bearded up to the eyes, he has no expression except in his eyes. Sailors' eyes are very steady and well under control. Up to the present he has made no sign; and, if I were to finish to-morrow, he would come through it with flying colours. He is like a rock, and I am like the waves breaking on it—I must go on breaking before I can make any impression. If he is telling the truth, he will not mind the process. But if he is lying, I shall find it out before five or six days."

"Five or six days!" echoed Dick dolefully.

"Meanwhile," added Mr. Eustace, "you can make further inquiries as to whether any vessels were near Whale Islands at the time of the disaster."

Dick exhausted himself and a fair proportion of the shipping world in these inquiries, but without result. It appeared that the vicinity of Whale Islands was, as far as vessels were concerned, a desert.

### The Captain Hesitates

On the third day of the cross-examination Mr. Eustace had brought the story down to the point at which the fog had suddenly descended upon the "Lancelot." Two suspicious circumstances made their appearance at this stage. Fogs were unusual events in that latitude, and during that season. And when the fog appeared, the first and second mate and the engineer had fallen ill with a disease which the captain described as enteritis. As the crew had taken French leave at the first port they had reached, everything depended upon these four; that is to say, on the captain alone.

On the first of these questions Mr. Eustace appeared unexpectedly as an expert on fogs. He cited Tyndall and Aitken and a dozen other investigators, and he eventually drew from Captain Luxmoor the admission that a fog under the atmospheric conditions revealed by his log was something of a miracle. This was the first point scored, and even Dick could perceive that it had some effect on Captain Luxmoor. The expression of the witness's eyes had changed. From being blank and unconcerned they had become alert and wary. And there was a longer pause than usual between question and answer.

Another day was spent in discussing the absence of other craft during the four days preceding the foundering. The whole system of look-outs was minutely investigated, and with a negative result. Not a flag, not a light had been seen, nor a fog-horn heard for four times twenty-four hours.

### A Word about Sardines

A second point was, however, scored when the mysterious sickness among the responsible officers was investigated. Mr. Eustace professed an inexhaustible curiosity about the cause of sudden illness in the case of such sturdy men as the mate and second mate and the engineer appeared to be. He called upon Captain Luxmoor to give details of the diet on board. The records were ransacked to discover where the microbes could have lurked before they emerged to keep the three officers conveniently in their bunks during a chronic fog.

It was Captain Luxmoor himself who suggested sardines.

Mr. Eustace levelled a long forefinger at him and smiled benignly.

"Were sardines among the stores?" he asked.

"No, they were not."

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"How, then, could the cause have been sardines?"

"Because I took a few tins on board, on my own account," retorted Captain Luxmoor.

Mr. Eustace dwelt upon this luxurious act with so much invidious humour that Captain Luxmoor lost his temper.

"D—n the sardines," he roared.

"And I have no doubt the first mate and the second mate and the engineer said the same," remarked Mr. Eustace pleasantly.

### Despair

When all was said and done, however, the captain's story was not seriously shaken. If all the crew had been present there might have been some chance of contradicting his evidence about the fog, but with only the mates and the engineer available there was little hope of making a breach in that manner. Dick foresaw that their evidence would be a blank. According to their depositions, they had all been sick men, who had had no thought for anything but Davy Jones's locker.

Dick yielded once more to despair. He was convinced that time and money had been utterly wasted. And when he called in the evening to "report progress" (ironical phrase!) to Amy, he told her so with almost tearful emphasis.

"My dear boy," she said, "you want a tonic!"

"I want Captain Luxmoor's blood," he replied.

"You shall have it. Let us go down to the exhibition to-night."

"Is it on tap there?"

"Silly! There was no connection between my first and second. Come along, and let's enjoy ourselves. It will do you good."

Dick groaned and protested, but, of course, he went. They strolled through the Hall of Lights, the Machinery Gallery, and the Palace of the Arts, and finally, led by luck and Amy, they came to the most interesting place of all—the Marconi exhibit.

"Let's go in and see it," pleaded Amy. "Perhaps Jack Binns is inside."

Mr. Binns was not inside, but the exhibit was presided over by a sun-burned young man who, one may be sure, was quite ready to behave like Jack Binns if the lucky chance came his way.

This young man smiled brightly when Amy entered, but modified his welcome when he caught sight of Dick behind her.

"Can I send a message?" asked Amy.

She could. The operator signalled the station in another part of the grounds, and asked her what the message was.

"My costume was made by Madame Aubert," she said.

It is to the operator's eternal credit that he did not smile. He tapped the message out with perfect solemnity. Nevertheless, he allowed some faint signals of amusement to appear when the answer came back.

"Shall I read it?" he asked.

"Oh, do!"

"The reply is, 'Mine was made by contract.'"

### The Lady Moves

Amy was delighted, and to show her delight she sat down and began to talk to the operator as if he were her nephew.

"Tell me," she said, "all the voyages you have been."

It is possible that the operator drew upon his imagination to some extent, since a rapid calculation proved to Dick that the young man must have become a Marconi operator at the age of three. However, Amy listened as Desdemona did to Othello.

"Now tell me," she repeated, "have you ever been near Whale Islands?"

"Within fifty miles," replied the operator. "Not any nearer, thank you! It was about four months ago."

"And did you sight a vessel called the 'Lancelot'?"

"The 'Lancelot'?"

"Yes, a steamer of 4,000 tons, painted a dirty white, with a high freeboard and a black strip along the side, and two masts with no drake. Surely you must!"

"Good gracious, Amy," Dick broke in, "you remind me of the villager who was surprised that the returned emigrant had never met his old friend Farmer Giles in the States!"

"Don't be rude, Dick. I am only asking questions."

"So was he."

The operator expressed his deep sorrow at not having sighted the "Lancelot." Amy graciously forgave him, and took her leave.

### The Operator Remembers

She had not gone far, however, before she heard the sound of rapid footsteps behind her. The operator appeared, breathless and apologetic.

"I suddenly remembered," he said, "that when we were near Whale Islands my brother sent me a wireless message about a boat. He is operator on the 'Miranda,' you know, a yacht that has been cruising all over the place. We were having a long talk together, when his signals were suddenly interrupted. He explained that there had been a thunderstorm; and in the middle of it the captain had got a whacking scare, because a triple flash of

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lightning showed a vessel close on the port beam. What scared them was that she was so near, and had no lights. He described her at the time, and I remember something about a white hull and a black funnel."

Amy looked at him as if she wanted to throw her arms round him and kiss him.

"What date was that?" Dick inquired hastily.

"Wait till I think," the operator replied.

They waited till he thought.

"It must have been about the middle of May," he said.

"Can you fix the exact date?"

"Not at the moment; but I can from my records. Is it important?"

Amy flung her arms out. "It is everything!" she cried.

"All right. I can let you know to-morrow."

Dick explained the situation to him, and arranged to meet him on the following afternoon. Amy smiled upon him till he positively blushed—a magnificent tribute to the service.

"There, you see," said Amy, as they turned away, "it is quite simple if you go about it in the right way."

"Simple!" exclaimed Dick. "You don't know what you are talking about."

"Yes, I do. Hurry up, now!"

"Where are you going?"

"Never mind. You do as I tell you. Take me to the nearest entrance, and call a taxi-cab."

They drove first to Amy's house in Hampstead, and thence to Marconi House. On the way citywards Amy asked Dick a number of questions which showed that she understood the case almost as well as Mr. Eustace. Then she relapsed into thought, with knitted brows and puckered lips.

### At Marconi House

At the Marconi telegraph office she wrote out a long message. Occasionally she asked Dick to spell a word for her, but she did not let him see the message until she had written the last word. Then she handed it to the clerk with the casual air of a stockbroker sending a sixpenny telegram.

"Please send that at once."

The clerk looked at it and raised his eyebrows.

"This is rather unusual," he ventured, and murmured something about the cost.

"I don't care what it costs," Amy replied, producing some banknotes.

Dick swore under his breath, and caught her hand. She looked round at him quickly.

"If you dare," she whispered fiercely, "I shall give you back the ring."

"Good Lord!" said Dick, resigning himself.

"This is my affair," added Amy. "You men don't know how to manage anything." Turning to the operator she continued, "I want that message sent at once, and if it is not delivered in twelve hours I shall complain to Mr. Marconi and the Postmaster-General, who are both personal friends of mine." Dick was on the point of protesting against this magnificent lie, when the edge of a heel on his shin made him reconsider his objection. "I shall leave you enough money to pay for the message and for a reply of equal length."

"We shall have to find the 'Miranda' first," said the operator.

"She is somewhere in the North Atlantic," replied Amy. "You can find her more easily than you can find a collar stud."

### Playing for Time

Dick went to bed that night with the feeling that the world had gone mad. When he awoke in the morning he had some difficulty in persuading himself that Amy's wild performance had been a reality. But he had enough faith in his recollection of events to tell Mr. Eustace to play for time.

The day brought forth nothing. Dick kept a messenger waiting at Marconi House, and several times he himself darted out to make inquiries on his own account. As the day wore on he became haunted by the conviction that the "Miranda" herself had sunk to the bottom of the sea.

He had given Mr. Eustace only a vague idea that he was hoping for further news. The possibility of a reply from the "Miranda" was so remote that he had not the courage to suggest it definitely. Mr. Eustace told him that the process of cross-examination could not go on for ever; and he mentioned the luncheon adjournment on the following day as the utmost limit.

That morning was one of the longest, and yet the shortest, that Dick ever spent. The agony of suspense made it long, and the desire for time, and yet more time, made it seem short. He kept one eye on the clock and another on the door, and each time that the door opened his heart leaped in hope, only to sink back in renewed despair. Twelve o'clock, one o'clock, came with mocking swiftness. Then the big hand began to drop past the quarter, towards the lowest, and, for Dick, the last figure.

At twenty-five minutes past one the door opened, and this time not in vain. Dick clutched the envelope from the messenger's hand and tore it open. He had to steady himself with a great effort before he could read a single word; but when he had read the message he was cool and collected. Seizing a moment when the witness was consulting a chart, he handed it to Mr. Eustace.

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"Adjourn till five minutes past two," said the usher.

"I have just one or two questions to put to you before I am finished with you, Captain Luxmoor," said Mr. Eustace.

Captain Luxmoor answered with a nod and a grim smile.

**More Wonderful than Wireless**

After the luncheon adjournment Mr. Eustace was even more bland than usual.

"Let us go back a little," he said, "to the night of the 14th May."

"Yes."

"That is to say, to the night of the thunder storm."

Captain Luxmoor made no sign for a few seconds; then he looked up sharply.

"What are you talking about? There was no thunder storm."

"Was there not? Have you forgotten so soon?"

Captain Luxmoor glared at him wildly. His mind seemed to be reviewing his evidence, as if to recall how and when he had spoken about a thunderstorm.

From that point Mr. Eustace proceeded coolly and ruthlessly to break the witness. From the moment that the thunderstorm had been mentioned, it must have been obvious to Captain Luxmoor that the flaw which always exists in even the best-planned scheme of villainy had showed itself. Within two hours—and although not a line of the telegram had been read in court—the witness had practically admitted every vital fact which it contained. On the night when the "Lancelot" had been supposed to be feeling her way through a dense fog, she had been plunging along at full speed, with her lights out, on a course three points to the north of the course which would have brought her clear of Shark Reef.

. . . . . .

"It is a wonderful thing, wireless telegraphy," remarked Amy that evening, after the event had been discussed, with affectionate interludes, for the hundredth time.

"Wonderful enough," Dick admitted. "But I know something more wonderful."

Amy beamed upon him. "Flatterer," she said.

"I was referring to women in general, not to you in particular," protested Dick.

## Men—and Their Hats

THE only man who can afford to lose his identity is he who is wanting in all egotism and self-respect. Fortunately, specimens of this class are becoming rarer and rarer. This growing rarity is no doubt due to the advance of education and the increased facilities of travel whereby men can for a while immerse themselves in the vortex of civilisation ere they migrate once more to the wastes of suburbia. As a result our streets are infinitely more interesting, our fellow man so much more worth our while contemplating. Even in the matter of hats this change is apparent. Not so very long ago the City was besieged each morning by an army of tailors' dummies, each immaculately turned out in top hat, frock-coat, and stripey trousers. Then followed a short period, when the bowler in its multiple shapes of inconceivable ugliness was *de rigeur*. But at last *nous avons changé tout cela*. We have dared to flout fashion in her own domain, and make a bid for variety—soft felts, hard felts, round hats, squash hats, top hats, Homburgs, Panamas, and Tyrolese, all are in fashion together, with that latest favourite, the cosy, soft, and velvety Velours. What is the result? We can tell what kind of man our neighbour is by the hat he wears. The "correct" inheritor of family tradition still clings to the well-groomed, glossy top-hat and well-cut morning coat. The conscientious but unaspiring clerk is content with his hard felt. The owner of an artistic or philosophic temperament requires something more adaptable and unconventional, so favours the slouch hat, while his more prosperous comrade finds a velour satisfies all his requirements. Finally, there is the man who must always be up to date, and is willing to waive personal attractiveness for the prevailing fashion. At the present moment he, too, wears the velour, but tucks a mount of wild-fowl feathers or a tuft of badger hair in the hat-band; and if he be lacking in the saving sense of refinement, this addition assumes quite startling proportions. Perhaps some of my readers may be inclined to doubt my statements. Well, if they do, let them go to Messrs. Henry Heath, Ltd., of Oxford Street, Piccadilly, Cornhill, and Moorgate Street, where they will be able to convince themselves of my veracity I suggest this firm, for they are the *cognoscenti* of the hat trade. Their hatterie was inaugurated in the days of George IV., and ever since that time they have been the premier hatters, with royalty for their *clientèle*. They have followed the fortunes of the hat through its varied career, from the tri-corne to the velour. But "followed" is hardly the word, for they themselves have been its pioneers, and it is through their instrumentality that the public have been educated to the present-day elegance in the fashion of hats. One speciality of theirs is the wireless silk hat! If the material used in the hat is sound, there is obviously no need to adopt a means to keep it in shape.

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## Personal

Commander W. H. G. Bullard has been appointed chief of the Navy Department's radiotelegraph office in Washington, and will have charge of all the wireless stations of the department.

Mr. E. Sallis, who represents Marconi's Wireless Telegraph Co., Ltd., in Brazil, has opened offices at 76 Rua de Ouvidor, Rio de Janeiro.

Mr. Charles J. Close has been appointed to represent the Marconi International Marine Communication Co., Ltd., in the North-Eastern counties. Offices have been acquired at Milburn House, Newcastle-on-Tyne. The registered telegraphic address of the north country branch is "Expanse, Newcastle," and the telephone number Central 1125.

MARCONI ATHLETIC CLUB.—The Annual Dinner will take place at the Holborn Restaurant on Saturday, March 8th. It is hoped that every member of the Club will make an effort to attend. Mr. W. W. Bradfield will preside at 7 o'clock. After the Dinner a Concert will be held.

## Movements of Engineers

E. J. Watts has returned from Shanghai, China, and will shortly take foreign service leave.

W. B. Cole is temporarily at Cowes, Isle of Wight, supervising the work of installing a torpedo-boat destroyer with Marconi apparatus for the Chilian Government.

J. C. E. Chevallier, who has been in the service of the American Marconi Company, has now joined the parent company as probationer engineer, and is at present at Chelmsford undergoing a course of instruction at the company's works.

P. H. Flood-Page and R. Price-Smith have joined the engineering department of the Marconi Company as assistant draughtsmen, and are engaged in the drawing and design section at Marconi House.

A. W. Hall and W. F. Kent have joined the engineering department of the Marconi Company as test-room assistants, and are engaged in the test-room of the company's works at Chelmsford.

R. J. Hobson has resigned from the company.

S. F. Kos has been transferred to the construction section of the engineering department, and is now assisting with the work of that section at Marconi House.

A. H. Morse has been transferred from London to Poldhu, where he is now temporarily attached for experience in turbine and high-power stations work generally.

V. Muirhead, an engineer in the service of the Russian Company of Wireless Telegraphs and Telephones, who has been undergoing a course of instruction in up-to-date work at Broomfield Instructional School and Chelmsford Works, has now returned to St. Petersburg, Russia.

D. H. and L. S. Payne have been transferred from Poldhu to the ship equipment section, and are now at Glasgow and Liverpool respectively for experience in practical ship-fitting work.

P. E. Privett has been transferred from Broomfield to Poldhu high-power station for experience in power-station running.

H. S. Tisshaw has been transferred from Clifden high power station to the head office, London, and is now temporarily attached to the engineering department.

R. C. Tootill has joined the company as probationer engineer, and is stationed at Chelmsford in the test-room of the company's works.

O. Trost, who has until recently been assisting in special experimental work at Chelmsford, is now temporarily at Clifden high-power station.

Engineers attached to the ship equipment section of the engineering department are located as follows:

G. J. Boome, London Docks.
F. E. Robinson, London Docks.
G. H. Major, London head office.
N. C. Rackstraw, London head office.
K. Tremellen, London head office.
W. H. Brown, Glasgow district.
A. Flood-Page, Glasgow district.
D. H. Payne, Glasgow district.
W. H. Venn, Glasgow district.
G. S. Wood, Hull district.
F. E. Burrowes, Liverpool district.
W. F. Fielding, Liverpool district.
L. G. Jeffery, Liverpool district.
L. S. Payne, Liverpool district.
H. F. J. Merton, Liverpool district.

**(Brazil)**

Mr. Welpley arrived in December last to take charge of the department concerned with military equipment.

## Movements of Operators

F. H. Baker, from the "El Argentino" to the "Urubamba."

A. S. Beattie, from the "Commonwealth" to the "Mongolia."

F. A. Bradley, from the "Dunluce Castle" to the "Vauban."

J. M. Butterworth, from the "Deseado" to the "Warwickshire."

J. G. Bull, from the London School to the "Athenia."

R. M. Chetham, from the "Amazon" to the "Athenia."

W. L. Cormack, from the "Urubamba" to the "Oronsa."

A. D. Cottingham, from the "Anselm" to the "Campania."

L. G. Croke, from the "Marengo" to the "Buffalo."

G. G. Chapman, from the "Vauban" to the "Highland Scot."

A. G. Dicks, from the "Virginian" to the "Rangatira."

L. A. Dods, from the "Merion" to the "Carpathia."

A. W. Davey, from the Liverpool School to the "Royal Edward."

R. Fraser, from the "Corinthian" to the "Caledonia" (Anchor).

H. J. Gallagher, from the "Persia" to the "Minnewaska."

A. D. Hathaway, from the "Asian" to the "El Argentino."

B. J. Hibberd, from the "Pretorian" to the "Tongariro."

W. C. Henderson, from the "Ivernia" to the "Empress of Britain."

E. L. Henri, from the "Arzila" to the "Ausonia."

**(Brazil)**

The following operators have been transferred from the Lloyd Brazileiro staff to the ships named:

Euclides Silva, to the "Minaes Geraes."
Mathias de Araujo, to the "Sao Paulo."
José Campos, to the "Rio de Janeiro."
Bernardino P. Barreta, to the "Bahia."
Ricado F. de Lima, to the "Ceara."
Sebastiao Campos, to the "Para."
José Rebeiro, to the "Acre."
Severino P. de Oliveiro, to the "Maranhao."
Joaquim M. Lopes, to the "Olinda."
Antonio a Ferreira, to the "Brazil."
Daniel Collins, to the "Manaos."
Carlos Magno Filho, to the "Sergipe."
Atahualpa Magalhaes, to the "Jupiter.
Augusta Costa, to the "Sirio."
Marcelino Garcia, to the "Orion."
None, to the "Saturno"
Manoel F. de Oliveira, to the "Aymoré."
None, to the "Iris."
Mario Samaruga, to the "Ladario."
Abel Fernandes, to the "Venus."
José M. Delfino, to the "Mercedes."

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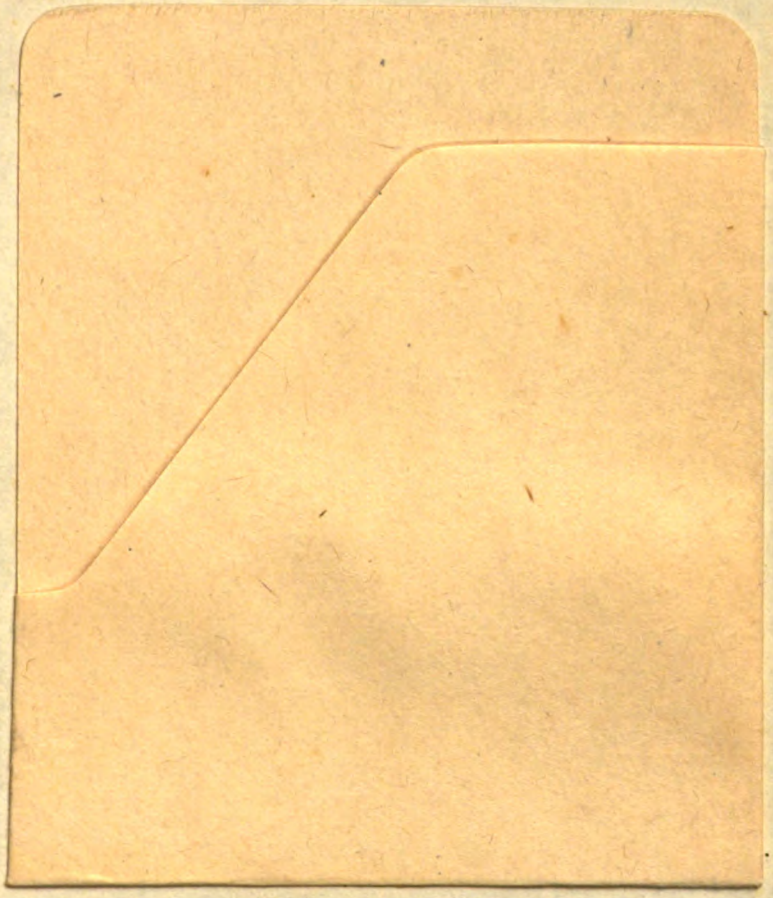

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